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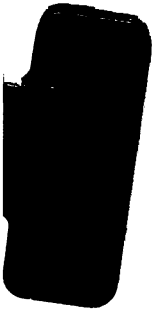

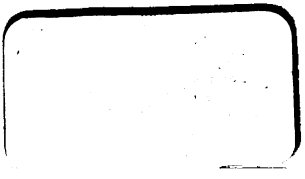

CHRONIC URETHRITIS

OF GONOCOCCIC ORIGIN

BY

J. DE KEERSMAECKER

Chief of Service, Diseases of the Urinary Organs at the *Centraalklinik* of Antwerp

AND

J. VERHOOGEN

Agrégé at the University of Brussels; Chief of Service, Diseases of the Urinary Organs at the *Polyclinique Libre*

TRANSLATED AND EDITED, WITH NOTES BY

LUDWIG WEISS, M.D.

Attending Physician to the Genito-Urinary and Skin Service, German Poliklinik; Dermatologist to the Hebrew Orphan Asylum, New York, etc.

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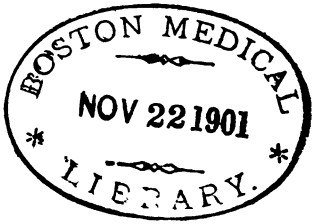

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PREFACE

THE procedures of exploration employed for the canal of the urethra have undergone remarkable improvements during the past twelve years. Thanks to these advances, it has become possible at present to carry out a complete study of urethral pathology. Numerous researches have been directed toward this end. Gonorrhea has especially been made the object of important researches, and we have been enabled to witness, under their influence, the therapy of this affection undergo incessant modifications, which one will search in vain to find duplicated in other special branches of the healing art.

When Désormeaux employed his endoscope for the first time, some forty years ago, he endeavored to establish a rational classification for the various forms of urethritis; but his attempt failed because the method was still too imperfect. The discovery of the gonococcus came in then to modify the conception which had been formed of the pathology of this affection, and endoscopic studies were abandoned, while all efforts were directed toward the newer route which had been opened up. Unfortunately, Neisser's discovery had but slight practical results, so far as the treatment of chronic urethritis is concerned. During this period the original instrument of Désormeaux underwent successive modifications. Nitze finally proposed the introduction of a luminous source

within the urethra itself, almost in contact with the mucous membrane to be observed and studied. The instrument which he devised, and which Heynemann, a mechanic of Leipsic, afterwards improved under my directions, possesses the practical qualifications which are indispensable to the macroscopic study of the lesions met with in the urethral mucous membrane.

It is thus that a suitable classification of these lesions can be established. The results which the urethroscopic study of the canal had already given me were confirmed by the anatomical researches of Neelsen and Finger. We may assert that the pathological anatomy of chronic urethritis is at the present completely studied. The utility of this study is evident. It is impossible to institute the treatment of a disease without knowing exactly its lesions. It is necessary, in chronic urethritis, as in all other diseases, to make a precise diagnosis. If this precision is insisted upon for affections of the larynx, lungs, eyes, bladder, etc., why should it be otherwise for the diseased urethra? The term chronic urethritis is quite as vague as that of ophthalmia or of gastritis; it masks an incomplete diagnosis.

Finding the gonococcus scarcely completes the insufficiency; if it is positive it proves the contagious nature of the discharge. Still, a negative result does not authorize a contrary conclusion, since it is demonstrated that in most chronic cases the microbe is found only exceptionally.

To arrive at a precise diagnosis and apply a rational therapy, we must resort to urethroscopy; all other instruments employed in the exploration of the canal give insufficient results. While urethroscopic study of the canal

permits us to arrive at the required exactitude from a diagnostic point of view, it gives also equally important results regarding treatment. It was thus, in a large measure, that I was led, in the treatment of chronic urethral gonorrhea, to employ a particular mode of dilatation.

Furthermore, once treatment is begun it becomes possible, by means of the urethroscope, to follow, step by step, the progress of the cure, to predict the exacerbations which may arise, and to recognize finally the moment, when all lesions having disappeared, the patient may be considered as cured.

More than fifteen years ago I described the method of dilatation which I have always since employed, and which has been gradually adopted in Germany and in foreign parts. I have added few modifications since this time, but the method has proven its own worth in the hands of my pupils, and its results are incontestable. I should, however, add that it cannot be employed with any certainty of success without the aid of urethroscopy.

The study of urethroscopy is long and laborious indeed, but the difficulties which a science presents should never discourage a serious worker; only superficial natures take fright at them. The appearances that the urethroscope reveal present an enormous variety, and are modified in the different portions of the canal. The lesions are often but faintly marked and difficult of recognition; but with a good method one learns, little by little, to know what he is about. In the work which Doctors De Keersmaecker and Verhoogen now present to the medical public, they have exposed with distinctness the principles of urethroscopy. Its study will thus become an almost easy matter

for him who is willing to devote to it the necessary time, for he can only attain it by perseverance and after having attentively examined a large number of patients.

As to the method of treatment which I have advised, it gives indisputable results. To succeed, the novice should conform himself exactly to the rules which experience has dictated. Later on, when he knows how to appreciate to their full extent, the results of each one of his interferences, he may permit himself, on his own responsibility, to take such liberties as he may deem useful; but before reaching this point he should have had an experience of several years. Furthermore, it is indispensable to be able to follow, step by step, during the whole course of treatment, the results obtained; and to accomplish this he must frequently examine the canal by means of the endoscope. No maneuver should be undertaken without a previous examination to determine whether it is surely indicated.

The results, however, which will thus be obtained are remarkable, and we can say that every chronic gonorrheal urethritis may surely be cured, provided that the lesions of the mucous lining of the canal are solely of gonococcic origin.

F. M. OBERLÄNDER.

DRESDEN, July 1, 1897.

EDITOR'S PREFACE

AFTER the exhaustive preface of the great authority on urethroscopy, there would scarcely be any need of another preface by the editor of this volume, were it not for a few words of explanation to the American medical reader.

The treatise in its original form deals with chronic gonorrhea of the urethra only. In view of the extremely frequent complications of the contiguous seminal glands, it seemed eminently appropriate to the editor to append a chapter dealing with some aspects of their involvement, dependent upon the gonorrhoic process.

Some gaps in the original work, as pointed out by many reviewers, prompted me to the attempt to incorporate in this work Chapter XIV, on Palpation and Expression of Cowper's, the Prostate, and the Seminal Glands; while Chapters XI, XII, and XV represent another effort, to acquaint the reader with details on the treatment of Chronic Gonorrhea, Urethral Asepsis, and the question of Gonorrhea and Marriage, respectively. Also revision and enlargement on the subjects of urethroscopy, instillation, flushing, gonococcus life, and treatment.

The urethroscope, or endoscope as it is still inappropriately called, has proved to be indispensable to the specialist, and ought soon to become as favored an instrument in the hands of the versatile general practitioner as the otoscope or laryngoscope.

The information it gives us in the diagnosis and treat-

ment of gonorrheal urethritis can only be appreciated by those who have been enlightened by its revelations. The exactness with which it enables us to perform rational dilatation under its control, the distinctiveness to discover granulations, diverticuli, or polypi, responsible for many an inexplicable, obstinate discharge, cannot be superseded by any other instrumental contrivance in use. Besides showing the *well-characterized* changes of chronic urethritis, it enables us to diagnose the earliest onset of a relapse, which the most painstaking exploration with bougies, etc., would fail to reveal. It enables us to localize circumscribed patches, erosions, and ulcers for topical applications; to treat or destroy the main abodes of the gonococci, the diseased urethral glands; to presage relapses, to determine the stage of infiltrations, and to pronounce a cure. In short, it furnishes information unobtainable by any other method or methods.

But in thus extolling the virtues of the urethroscope, I do not claim it to be a cure-all, to the exclusion of other well-tried methods in use. The reliance on bacteriologic and microscopic methods solely for diagnosis, without using clinical means, is a one sided procedure. Without doubt, the employment of both methods will bring us as near to perfection in the diagnosis and treatment of chronic gonorrheal affections as is possible in the present state of scientific research.

The joint authors of this volume have admirably succeeded in giving to the specialist an exhaustive and scientific presentation of urethroscopy in all its details, which, it is hoped, will prove a welcome guide!

The translation of this treatise was conceived by the

editor while pursuing his studies abroad, and enjoying the privilege of meeting the foremost representatives of urethroscopy.

The editor is conscious of some short-comings; yet he feels that his attempt to make urethroscopy available to the *general practitioner*, and acquaint his American *confrères* with so useful a department of our science, may not be in vain. If he has partly succeeded in this effort, he will consider himself amply rewarded for his labors.

LUDWIG WEISS.

77 East Ninety-first street,
NEW YORK, March, 1901.

Those portions of the text included between brackets ([ ]) have been added by the Editor.

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CHRONIC URETHRITIS OF GONOCOCCIC ORIGIN

INTRODUCTION

THE actual progress in the study of chronic urethritis during the last few years has completely modified the conception which had been formed of this very frequent disease. Therefore we have thought that it would be useful to take up the study of the question in its entirety again, paying especial regard to the facts as they actually exist. There is no chronic disease so wide-spread as gonorrheal-urethritis—its tenacity and its resistance to all forms of treatment are features universally known. We may add that the special gravity which it presents from a sociological point of view, and which is often hidden under insidious forms, did not clearly stand forth until recent discoveries of gynecology made it clear.

[The French use the word "blennorrhagie urethrale" to denominate what we call in the vernacular "clap," and the Germans, "Tripper." As a technical expression the words blennorrhea or blennorrhagia possess the advantage of being logically correct, but devoid of a more specific meaning. Blennorrhea comprises every discharge containing pus, while the term gonorrhea denotes only a flow emanating from the genital organs. The ancients identified the disease with the seminal flow. (Hence the name gonorrhea—from γόνος, seed and ῥεῖν, to flow.) Neisser, in giving the causative coccus the name gonococcus, conveyed to us

the meaning of a parasite contained in the flow. Although the generic term, gonorrhea, is etymologically incorrect, it is almost universally used in its application to a specific type of inflammation affecting the genito-urinary organs, and answers all practical purposes well.]

Besides, physicians themselves do not appreciate in general the importance of chronic urethritis. The whole tableau of the symptoms which it presents passes only too often unrecognized; only the purulent discharge, the *goutte militaire*, seems to deserve their attention. The importance that is accorded this symptom becomes even so predominant that it appears to constitute, in itself, the entire disease. All the efforts of therapy are directed against it, and if it disappears the disease is declared cured.

Nevertheless, whether there be a discharge or not, the disease continues its evolution, frequently carrying with it consequences of the most disastrous nature; for chronic gonorrhea of the urethra is not, as is often thought, a benign affection without gravity. It is, on the contrary, a redoubtable enemy, which seems at times, it is true, to remain inactive, but never becomes wholly disarmed.

At each instant the disease may take on again an acute form; it extends without cessation, and its immediate or remote complications form one of the most outbranching chapters of pathology. Finally the patient who is affected furnishes a focus of infection for others, the more dangerous because it is almost always unrecognized.

The affection may be transmitted unwittingly or innocently from the man to the woman, and provoke in the latter the occurrence of serious accidents of genital blennorrhagia with all its consequences.

[As early as 1872 Noeggerrath of New York maintained and emphasized the fact, alluded to by Bernultz in 1859, that gonorrhea, and especially the latent form, is the cause of many serious ailments in women. The acute and chronic metritis, endometritis, perimetritis, ovaritis are, in nine-

tenths of the cases, due to latent gonorrhea in man. We know that gonococci may lie dormant in Littre's glands, or in the secure depths of Morgagni's crypts, in Cowper's, or in the ducts of the prostatic glands, or in the remote abodes of the seminal vesicles. The "morning drop" of the patient may not show the presence of any gonococci, the scrapings of the urethral mucosa, the careful and trying examination of the threads in the urine may all prove negative, and yet there might be gonococci hidden in the contiguous tissues and glands. There they lie, seemingly innocuous in their latency, until a sudden mechanical impulse sets them free. Excesses in *Baccho* and *Venere* and irritations of the genitalia of a kind to cause often-repeated hyperemia; over-indulgence, better known as the much-complained of "strain"; chronic prostatitis, perchance even constipation, all these may cause, in a mechanical way, an expression of gonococci and a new invasion of the urethral mucosa by them.

We have but lately seen such a case of auto-reinfection in a young man who had gonorrhea two years ago. He went through a well-conducted treatment of permanganate of potash irrigations in vogue at that time, and afterwards with astringents. No discharge being present, he considered himself cured. Lately he appeared with a discharge for the origin of which he could not account. The patient we knew to be trustworthy, and there was not the slightest necessity to withhold the truth. He had had no sexual intercourse for six weeks. He complained of excessive constipation and of very frequent nocturnal seminal emissions. On examination, the meatus did not show any sign of inflammation, there were no pains on pressure on the fossa navicularis,—in short, not the slightest sign of an acute process. The discharge showed a few gonococci. We carefully washed out the anterior urethra with a warm boric acid solution until the fluid returned absolutely clear. On massaging his prostate, a viscid white fluid

soon trickled out of his meatus. Microscopic examination showed the presence of very numerous gonococci. Whence did these come? There can be no doubt that they came from the prostate. The patient, when he ceased treatment, must have had an uncured posterior urethritis which infected the prostate. Attenuated virulency of the gonococci did not at that time set up an acute prostatitis, but caused a chronic involvement of that organ with gonococci which remained latent until, by accident, they became again active. A thorough examination of a candidate for marriage is therefore a necessity.]

We will not dwell upon all the accidents to which this transmission may give rise. We will, however, recall the fact that from a social point of view, sterility in the woman is only too often the consequence of this gonorrheal infection of the genital tract and of the surgical mutilations to which it leads.

When gonorrhea is thus introduced into a family, are we to limit ourselves to looking after the purulent ophthalmia of the infants, the vulvo-vaginitis of the little girls, or the gynecological affections of the mother?

Should we not, on the contrary, go back to the origin of all these ills, and cure, first of all and in a definite manner, and completely, the gonorrhea of the head of the family?

Now it is quite rare that this result is obtained, owing to the fact that the diagnosis of gonorrhea in man is not made with all the exactitude and precision necessary. Besides, until recent times, it was a mysterious disease whose pathology was vague and whose lesions were scarcely known.

The discovery of the gonococcus (1879) cleared up this question. Since then works on this topic have multiplied and taught us, little by little, that gonorrhea is a specific disease, due to the action of a particular microörganism—the gonococcus. In its development upon the mucous lining this microbe produces in it an acute inflammation, a

urethritis of typical course whose violence and spread may be more or less extensive according to the resistance of the subject and, without doubt, also, the virulence of the infection.

At the end of a certain time the period of acute evolution is terminated, and the disease begins to retrogress.

At times the cure is effective in this manner, but most often gonorrhea, even subjected to a well-directed treatment, passes gradually into a chronic state. Lesions persist which, instead of disappearing have, on the contrary, a strong tendency to spread without ceasing.

Chronic urethritis is, accurately speaking, made up of the subsequent evolution of these lesions.

At the same time that this pathogenic conception of the disease was taking definite shape, the processes of investigation indispensable to diagnosis were being continually perfected. The canal of the urethra became directly accessible to visual observation, and its slightest details could be studied.

From this time on it became possible to follow here the evolution of gonorrheal lesions *in situ*, to determine, with exactness, its seat and extent, to observe its progressive advance or its cure. In a word, we were enabled at last to make a precise diagnosis.

The practical results of these advances were not slow in showing themselves. Up to this time the treatment of chronic urethritis had been purely empirical, and the physician found himself guided only by some vague precepts derived most often from incomplete observations.

All the general or local treatments, which promised to be appropriate for the urethra because they had given good results in the treatment of suppurative processes elsewhere, were successively advocated with enthusiasm and then abandoned after a more or less ephemeral existence.

A few local applications alone were retained because a prolonged usage had shown their beneficial effects. Such

was the case with the balsamics, the astringents, and the nitrate of silver. These were employed, however, more or less in a haphazard way, without their utility being accurately predicted or their action controlled. Such should no longer be the case. Henceforth the treatment of chronic urethritis cannot be left to chance.

An accurate diagnosis will be followed by a rational treatment; but, to arrive at this result, we must be able to make a complete study of the question.

The domain of gonorrhea in man is indeed vast. The disease can, in certain cases, become generalized and invade the entire economy. In its chronic state it is almost always limited to the genital and urinary organs.

In this work we shall limit ourselves to a study of chronic gonorrheal urethritis. For other localizations of the disease (epididymitis, cystitis, prostatitis, etc.), we must refer the reader to special treatises.

PART FIRST

ANATOMO-PATHOLOGIC STUDY

CHRONIC gonorrheal urethritis results from the evolution of lesions produced by the gonococcus upon the urethral mucosa. It succeeds directly upon the clap, when the acute phenomena have become ameliorated and when the disease takes on a slow course, which may become indefinitely prolonged. This passage into the chronic form is well defined; from an anatomic point of view, by the appearance of connective-tissue fibers at the seat of parvicellular infiltration, which invades the mucosa during the acute form. These changes appear after a variable lapse of time, generally toward the end of the second month of the disease; but they may also be retarded or show themselves much later. In other respects they do not correspond to a well-defined modification of the symptoms, because they do not appear at the same instant in the whole extent of the canal; they make their *début*, on the contrary, in a few spots, only to become generalized little by little. It is thus that gonorrhea passes slowly and gradually from the acute into the chronic form; and from this fact it results that one can never precisely indicate the moment when chronic urethritis begins.

To make the evolution of the disease clear, we will first briefly recall certain points in the anatomy of the normal urethra and the chief characteristics of the gonococcus, which are indispensable; we will then investigate the characteristic lesions of acute gonorrheal urethritis and, finally, we will observe the alterations which the canal undergoes during the whole course of chronic urethritis.

[The onset of chronic urethritis is not dependent upon the time which has elapsed since the acute attack, but upon the clinical symptoms which have developed after the acute attack has spent its fury. While some gonorrheas will run their course and finally wind up with a perfect cure, others — the majority, by the way — will lose all the characteristics of the acute process and slowly drift into a state of lessened activity.

Besides, some gonorrheas, especially repeated attacks of them, sometimes start *ab origine* with a slow intensity, representing a lenient form, commonly called *subacute gonorrhea*. But in the majority of cases acute gonorrhea, after having lost its highly inflammatory character, passes into a sluggish state, with neither pain nor any other functional symptoms, and accompanied only by a moderate secretion (subacute gonorrhea), which invariably drifts either into a latent aseptic urethral catarrh, or in chronic gonorrhea proper.

Therefore it is neither a gonorrhea of long standing, nor a refractory form of it, nor the time which has elapsed since its onset which characterizes chronic gonorrhea, but only the anatomical condition of the mucosa. Through natural or artificial healing influences the diffuse character of the acute state has given place to circumscribed lesions of a lasting character. These consist of erosions, granulations, epithelial changes, and of infiltrations of the glands and of the deeper layers of the mucosa.]

CHAPTER I

ANATOMY OF THE URETHRA

WORKS on anatomy describe in detail the situation and relations of the canal of the urethra; we will here speak only of its conformation and structure.

I. CONFORMATION.—In the flaccid state the urethra is a canal only in theory, for the walls are in complete apposition throughout its whole extent. In reality the canal exists only when the walls are spread apart to give passage to the urinary stream, or for the passage of some foreign body. This spreading is then the greater the more pronounced the tension to which the walls are subjected. They give way by reason of their elasticity, but once the limits of this elasticity are passed, they tear.

The caliber of the canal is thus not constant; it varies frequently and within wide limits. When the urethra does not functionate, it is reduced to its minimum, and the walls lie in apposition. If we make transversal sections of a flaccid urethra at different levels we observe that the canal has the appearance of a vertical slit in the regions of the glans, that it is transversal in the spongy region, star-shaped in the membranous portion, and takes on the form of an inverted Y in the prostatic region (Fig. 1).

In the state of distension, on the contrary, the form of the canal resembles that of a cylinder of irregular dimensions. The meatus forms almost always its most constricted part; it is almost inextensible and its dimensions are extremely variable. After the meatus comes the fossa navicularis, a small ampulla-like dilatation, which quickly contracts into a neck-like narrowing at times greater than

that of the meatus itself. Then comes the spongy portion, which has the form of a truncated cone, decidedly elongated with its summit anteriorly, and which consequently widens out progressively to attain its maximum at the bulb. It is at this point that the canal attains its greatest dimensions. Its walls, especially the inferior, are very extensible. This extensibility of the lower wall, along with the action of the sphincter, which is situated immediately behind, and maintains the urethra completely closed, forms at this point a depression which is the bulbar *cul-de-sac*. Then the canal again becomes narrowed at the point where it pierces Carcassoune's aponeurosis, and

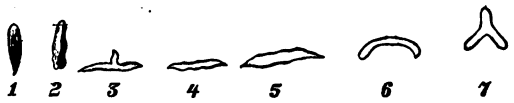

FIG. 1. TRANSVERSAL SECTIONS OF THE MALE URETHA AT DIFFERENT LEVELS. (After Quénu.)

1. At the external orifice. 2. In the middle of the glans. 3. At the base of the glans. 4. At the pars spongiosa. 5. At the height of the angle of the urethra. 6. At the beginning of the prostata. 7. At the height of the verumontanum

preserves a uniform diameter throughout the whole membranous portion, to take on a fusiform aspect in the prostatic region and, for the last time, becomes narrowed at the vesical neck.

The canal then forms a cylindrical, very irregular tube whose diameter varies within a wide range, not only from one portion and another, but also in the same part, according to the amount of distention which the walls undergo. When these dimensions are measured it is seen that the deepest parts are the most dilatable. It is thus that we can, without inconvenience, dilate the prostatic region up to 40 or 45 of the Charrière scale (13 to 15 millimeters). The membranous region, which is somewhat narrower, can be dilated up to 40; at times, however, it is difficult to go beyond 30 (10 millimeters). (Fig. 2.)

The dimensions of the anterior portion of the canal

progressively diminish from the bulb to the meatus. The bulbar region is quite as dilatable as the prostatic region, even reaching the size of 50 Charr. (16 to 17 millimeters). The diameter then progressively diminishes until behind the fossa navicularis it is only half that of

FIG. 2. CAST OF THE MALE URETHRA.
(After Sir Everard Howe.)

the bulbar region (24 to 30 Charr.). As to the dimensions of the meatus, of the fossa navicularis and of its neck, they are very variable. The average seems to be about 24 Charr., but we can often go up to 28 or 30. At other times, on the contrary, the meatus is exceptionally narrow and scarcely admits a very thin bougie, without such atresia being due to any lesion whatever.

II. STRUCTURE.—The urethra is formed of several layers of tissue which are:

1. *An epithelial layer* constituted in the prostatic portion by stratified pavement epithelium which passes gradually into the cylindric form toward the membranous region. The epithelium, in the neighborhood of the bladder, is in all respects similar to the bladder epithelium of which it is only the continuation. As we approach the spongy portion, the epithelium takes on more and more the cylindric appearance. The spongy portion possesses a stratified cylindric epithelium. The urethral epithelium is smooth, moist, and shiny. It shows by its transparency the color of the subjacent mucosa.

2. *A connective-tissue layer* constituting the mucous membrane. This layer is continuous anteriorly with that of the glands. It is fused posteriorly into that of the blad-

der, and consequently is continuous with the mucous membrane of the ureters and pelves of the kidney. It extends likewise into the ejaculatory ducts, the seminal vesicles, the vas deferens, and the epididymis. The mucous membrane of the urethra is very elastic; it clings firmly to the subjacent layers, especially in the prostatic region where it is impossible to separate them.

3. *A muscular coat* formed of smooth fibers which are very thick, especially in the membranous region. The most internal layer, and the one whose fibers are the finest, is longitudinal; the external layer is circular. At the point where the urethra opens into the bladder these circular fibers form a veritable sphincter, like a ring, which is indeed the internal *vesical* or *prostatic sphincter*. In the prostatic and membranous regions there exists a third layer of striated fibers. In the whole neighborhood of the bladder they appear above the urethra, forming a sort of arciform muscle (Finger) held between the prostatic lobes. These fibers increase in number as we advance, and when the urethra emerges from the prostate, they form a sphincter-like ring, *external sphincter* [the so-called cut-off muscle,] which is continuous with the muscles of the ligament of Carcassoune.

4. *An erectile layer* which exists only in that portion of the urethra situated anterior to the ligament of Carcassoune, and which is called the *corpus spongiosium* of the urethra. The spongy body dilates toward the extremity to form the *glans* penis. It dilates in the opposite direction, and thus forms a thick reflexion, round and prominent, which constitutes the *bulb*. The bulb is, in a way, appended to the interior wall of the urethra; it is covered over by the bulbo-cavernous muscle which keeps it fixed at this point. Its posterior extremity is, so to speak, shut in by the median perineal aponeurosis which separates it from the membranous region of the urethra.

In the angle formed by the jutting out of the mem-

branous portion are found Mery's or Cowper's glands which are likewise encased in the perineal aponeurosis.

These are the chief anatomical details of which we stand in need in order to understand the nature and treatment of chronic urethritis. For the other details which concern the length, the direction, the situation, and the bearings of the urethra, we refer readers to works on anatomy, especially for descriptions of the relations of the membranous portion at the point where it pierces the ligament of Carcassoune and the prostate.

The *internal surface* of the canal is not even or smooth. The mucous membrane, excepting in a state of complete tension, is doubled up and forms in the whole extent of the canal a series of *longitudinal folds*, more or less numerous and variously developed, which may be distinguished by means of the urethroscope, and about which we shall have more to say later on. There exist, besides, certain transverse folds which permit the mucous membrane to stretch out during erection.

The mucous membrane presents in its entire length *papillæ*, which are especially abundant in the region of the fossa navicularis. Finally, we observe upon its surface a large number of openings (*orifices*).

1. These are, first of all, small *culs-de-sac* (*Morgagni's lacunæ*) penetrating obliquely from before backward in the mucous membrane, and which are at times 0.01 millimeter deep (Beaunis and Bouchard). They are met with nearly exclusively in the superior wall of the canal (spongy region). Their dimensions vary. The largest are found along the median line and will admit the head of a pin. Their number varies greatly, there being at times as many as twelve. By reason of their oblique direction in the thickness of the tissue, their upper wall forms a sort of valve. The most developed of these valves, the *valve of Guerin*, is situated at about 0.015 millimeter from the meatus. The *cul-de-sac* which it forms measures 0.004 to 0.006

millimeter. Its importance and the obstacle with which it may oppose catheterization have been greatly exaggerated. It suffices to follow the floor of the canal in order to escape it. The lacunæ of Morgagni do not secrete any fluid.

2. *Closed follicles* which have 0.0001 millimeter diameter; they are situated immediately beneath the epithelium, and are considered as rudimentary glands of Littre.

3. The *glands of Littre* are found scattered in large numbers throughout the whole length of the canal from the meatus to the bladder. They are encountered in great abundance upon the roof where their orifices form a closely aggregated dotting. The glandular body is rudimentary in the membranous and prostatic urethra. It is most developed in the roof of the spongy portion. Their situation as to depth varies somewhat: at times the gland is found immediately beneath the epithelium, again it is placed deeply in the mucosa, and penetrates even between the trabeculæ of the spongy bodies. The excretory duct, consequently, varies in length from a few millimeters to two and even three centimeters and, exceptionally, it is found still longer. Generally it is rectilinear with oblique direction toward the meatus. This direction is the more oblique the more we have to do with the larger glands and those nearest the meatus (Reliquet and Guépin). They open now on the surface of the mucous membrane, again in the cavity of Morgagni's lacunæ. The glands of Littre are conglomerate glands which secrete a mucus destined to lubricate the walls of the canal.

4. *Prostatic follicles, Mery's or Cowper's glands*, also open on the surface of the urethra. But the inflammation of these glands constitutes a special complication of urethritis, and we again, for this reason, refer to the special works on the subject for their study.

In the prostatic region the mucous membrane forms a sort of crest, which is the *verumontanum*. It is made

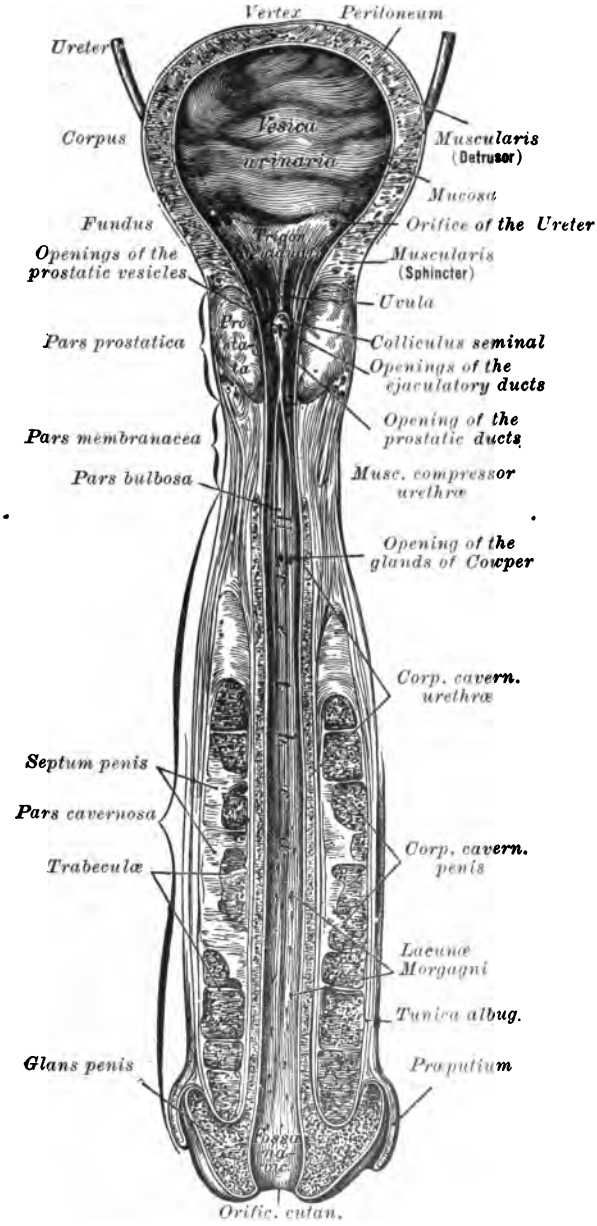

FIG. 3. LONGITUDINAL SECTION OF THE PENIS, URETHRA, AND BLADDER. Showing the relations of the parts as looked at from above. (After C. Heitzmann.)

up thus: The external angle of the *trigone of Lieutand* (bladder) enters into the first part of the prostatic portion, which is somewhat broadened and extends over the floor in the form of a quite long but slightly prominent fold. This delicate reduplication is puckered up at one point of its course and forms a more considerable eminence, which is the verumontanum (*colliculus seminalis, caput gallinaginis*). The verumontanum generally contains, on the right and left, the orifices of the ejaculatory ducts; in the center is found a small depression, which is the *prostatic utricule.* Upon both sides the mucous membrane is pierced with punctiform openings, which are the excretory orifices of the prostatic follicles (Fig. 3).

CHAPTER II

THE GONOCOCCUS

THE gonococcus is the specific micro-organism of gonorrhea. Its existence was long suspected by authors who could not admit that clap was a simple, innocent inflammation, but who would make of it rather a special virulent and contagious disease.

It was Neisser who, while assistant at the Dermatological Clinic in Breslau, in 1879, discovered the true pathogenic agent of gonorrhea, gave to it the name which it has since kept, and demonstrated its presence in all instances of gonorrhea, both urethral and ocular. His results, at first strenuously contested, were confirmed quite soon by a host of authors. At the present day works upon the subject exist in abundance.

When we examine a drop of fresh pus from a case of acute gonorrhea under the microscope, without previous manipulation, we distinguish within the leucocytes minute refractive bodies, collected in groups, quite distinct from protoplasmic granulations, and generally endowed with movements of oscillation and rotation. These are the gonococci. In order to study the morphologic details of the gonococcus it must be stained.

I. PREPARATION AND STAINING.—The gonococcus possesses a marked affinity for basic anilin colors. The violets especially (methyl-violet, gentian, dahlia) stain it directly and without mordant, as well as rapidly and without the aid of heat. Fuchsin, either the simple or carbolated solution (Ziehl's solution), is an equally good stain. Methylene-blue, although less energetic, is, however, the

reagent of choice, because it permits, in an admirable manner, of differentiation of the various elements in the preparation, the cellular protoplasms being scarcely tinted and the nuclei being clearly outlined, while the gonococci, of a blue more pronounced than that of the nucleus, present a very clear shape.

On the contrary, the acid anilin stains (eosin), and hæmatoxylin only feebly impregnate the gonococcus and give to the whole preparation a uniform color. If the gonococcus is easily stained it is decolorized quite as readily under the influence of alcohol, acids, essences, and by all the usual decolorizers. These three properties which we have just enumerated—strong affinity for basic colors, feeble affinity for acid colors, and rapid decolorization by alcohol—form the basis of all procedures in the preparation of specimens of the gonococcus.

Simple Staining.—The following is the plan which seems most practical:

1. The pus to be examined is spread out upon a slide, dried, and fixed in the flame of an alcohol lamp.

2. A drop of methylene blue is placed upon the preparation (Kuhne's carbolated blue, Lœfler's solution).

3. Wash immediately, dry, and examine without cover-glass by placing the immersion oil directly upon the preparation.

Double Staining.—This is not for general use, simple staining generally giving quite satisfactory results. It has for its object the coloring of the microbes in a different manner from the neighboring tissues. Combined with the decolorization by the Gram method, it permits, in ninety-five per cent of instances, the establishment of a positive diagnosis.

[If a double stain is desired, we recommend the following, which gives excellent results and is easily carried out. It is known as Lanz's method: A saturated solution of fuchsin and thionin in a two per cent aqueous carbolic

solution are mixed in the proportion of 1 to 4. The specimen is stained with it for half a minute, and then rinsed with water. The gonococci appear blue, the protoplasm of the pus-cells red, the nuclei bluish red, epithelia deep red, and their nuclei reddish blue.]

The following is Steinschneider's procedure:

1. The pus is spread upon a cover-glass, dried, and fixed by the flame.

2. The cover-glass is placed for two or three minutes in a saturated solution of anilin gentian violet.

3. The decoloration is carried out for one minute's time in the iodo-iodid solution. (Iodin 1, iodid of potassium 3, distilled water, 300.)

4. Wash with alcohol until the latter is no longer stained by the violet.

5. Color with Bismarck brown.

The gonococci are brown, the other diplococci blue.

Staining of Sections.—(Wertheim.) To color, cut the section after fixation in alcohol and imbedding in celloidin. Wertheim employs the following method:

1. The section is left for from three to five minutes in anilin gentian violet.

2. Wash and place for one minute in lugol solution.

3. Decolorize in ninety-five per cent alcohol; the section should retain a distinct violet color.

4. Place for some minutes in an aqueous solution of methylene blue.

5. Wash with water, dehydrate with absolute alcohol, clear up with essential oil, and mount in balsam.

[One of the latest devices for examining for gonococci in sections of tissues is given by Finger, (*Centralblatt für die Krankheiten den Harn und Sexual Organe*, Vol. V, No. 7), as follows:

Put the section into borax-methylene blue (borax 5, methylene blue 5, water 100), for five minutes. Decolorize for one to two minutes in acetic acid one-half of one per

cent strong, wash in absolute alcohol, and mount in balsam.]

[We append here some of the details of the staining process for those not well versed in the methods, who may like to avail themselves of a more minute guide.

The glans penis is cleansed by a cotton pledget soaked in a bichloride solution, 1 to 1000.

A platina loop mounted on a glass rod is then held in the flame of an alcohol lamp or Bunsen burner until it turns cherry red, and then withdrawn and allowed to cool. The loop thus sterilized is then introduced into the urethra by gently gliding down through the fossa navicularis and a little beyond. The little secretion thus obtained is placed on a clean slide and spread out on it with the aid of the platina loop. A much more even distribution and a thinner film is obtained by pressing another slide on the top of the first one and sliding them upon each other, without separating them. We have thus obtained two specimens for control examinations. The specimens are now allowed to dry in the air for ten minutes. If in a hurry they may be dried over the alcohol flame, but the first way is the better one.

The next step is the fixation of the specimen by passing it, with the film side downward, three times rapidly through the flame. This procedure has a two-fold aim. It turns the albuminous parts of the specimen into insoluble albuminates which otherwise would become blurred under the disintegrating influence of the staining fluid. On the other hand it arrests the movements of the bacteria and makes observation easier.

Now follows the second part, the staining of the specimen. Among the many staining devices we will only mention those that combine excellent staining power with easiness in execution. The simplest and best method for ordinary staining is by a saturated aqueous solution of methylene blue. Of this a drop or two is placed on the

specimen and left there from a half to one minute. It is then rinsed with distilled water by means of an irrigator until the water runs off unstained. The slide is then placed for a few seconds on its edge upon filter paper. This drains off the superfluous water. It is now laid down flat and blotted until dry. By holding the slide, film upward, over the flame of a spirit lamp for a few seconds, we can promote quick drying.

The third and final step consists of placing a drop of immersion oil directly on the specimen *without* using a cover-glass. It is now ready to be put under the immersion lens of the microscope, and to be examined.

A good bacterial microscope should be provided with an oil immersion lens $\frac{1}{12}$, an Abbé condenser, and an iris diaphragm.

If a permanent specimen is desired, a drop of Canada balsam (obtainable in collapsible tin tubes) is put on the film, a cover-glass is pressed down upon it, driving out the air-bubbles. An excess of the balsam will accumulate alongside the edges of the cover-glass, which soon hardens, walling in, as it were, the preparation in an air-tight encasement. A drop of immersion oil is now placed on top of the cover-glass, and the specimen is ready for examination.

This staining with methylene blue is accomplished in a very little time, the whole process being finished in a few minutes, and gives excellent results. Although only a single stain is used, it is practically a differential stain, inasmuch as the gonococci appear deep blue, while the polynuclear pus-cells and epithelial cells take up a lighter blue color. The gonococci are found in masses either free outside of the pus-cells as if expelled by their having ruptured the protoplasm, and appearing in groups around the boundaries of the destroyed pus-cells, or they may be seen in part within the pus-cells and sometimes upon the epithelial cells. As the purulent process progresses, the cellu-

lar constituents diminish, pus-cells prevail with intra- and extracellular gonococci in profusion. Toward the termination of the process we see these get scarcer, transition (uninuclear) epithelium cells appear in numbers, and a few hyaline "iodophile" epithelium cells (which stain rapidly with weak solution of iodin) also.

The gonococcus belongs to that class of bacteria which do not stain with iodin. This peculiarity is used to establish, in a negative way, the identity of the gonococcus from the other diplococci which inhabit the normal as well as the diseased urethra. These latter microbes are stained by iodin and are thus distinguished from gonococci, while the gonococci are decolorized by iodin, and consequently will no longer appear in the field. If, therefore, there is the slightest suspicion that the diplococci brought out by the simple methylene blue staining process may not be the real gonococci, we will have recourse to the controlling iodin staining, known as Gram's method. One of the main ingredients of Gram's stain is an anilin-water gentian violet solution, devised by Koch-Ehrlich, which, however, does not keep well when made in bulk and soon loses its staining power. It is therefore always advisable to prepare it fresh. Heiman, New York, gives the following detailed working formula, which every practitioner can carry out:

"To ten cubic centimeters of water add two cubic centimeters of anilin oil, shake well, and filter through moist filter-paper. To the clear anilin water obtained, add one cubic centimeter of ninety-seven per cent alcohol and one cubic centimeter of a concentrated alcoholic gentian violet solution. This is about the quantity required for ordinary staining. After passing the cover-glass quickly through the flame, it is then placed in this solution from two to three minutes. Gram next advises that the cover-glass may be washed in alcohol or not. I preferred to drain off the excess on filter-paper without washing in alcohol. The cover-glass is then placed for five minutes in Gram's

iodin solution, which consists of iodin, 1 part; iodid of potash, 2 parts; water 300 parts, and then placed directly into alcohol (97 per cent) in order to wash out all the coloring matter. It is sometimes advisable to renew the alcohol. Now wash the cover-glass well in water and place it in a Bismarck brown solution, which consists of a concentrated aqueous Bismarck brown solution, 1 part, water, 5 parts, for one or two minutes, then wash in water and mount in balsam. For differential stain, instead of Bismarck brown I have employed fuchsin and safranin, only to find that the Bismarck brown gave the best results. It is to be regretted that we have not at present a specific stain for the gonococcus, as we have for the tubercle bacillus."

The main cause of the unsatisfactory results in employing Gram's method was due to washing the specimen with water between the two staining processes. Only the use of absolute alcohol in the preparation of the stains as well as for decoloration purposes insures successful results. The use of the two and one-half per cent carbolated water gentian violet solution of E. Fraenkel (ten parts of saturated alcoholic solution of gentian violet to ninety parts of two per cent carbolated water) is just as desirable as Ehrlich's anilin-gentian violet and more durable. Weinrich recommends to prepare the Bismarck brown in the following way: Hot distilled water, 70; Bismarck brown, 3; alcohol (96 per cent), 30; to be used when cold. As another counter-stain, Victoria blue is recommended (1 part of a saturated solution of Victoria blue to 100 parts of water). The specimen may now be washed with water, and also after it has been decolorized with alcohol, but never *before* Gram's solution is applied.]

II. MORPHOLOGICAL FEATURES.—In specimens stained by the processes which we have just described, the gonococcus appears in the form of an ovoid diplococcus, more deeply stained than the neighboring tissues. It is made

up of two portions separated by a clear line. Each of these portions has the form of a bean with its concave surface to that of its fellow. The whole appearance is suggestive of certain small rolls called in Germany "Semmel."

The *dimensions* of the pair are quite variable. The larger individuals divide transversely and thus give rise to a new pair. Bumm gives the following figures, obtained by means of a Zeiss $\frac{1}{18}$ objective and a micrometric ocular, in examining cover-glasses slightly stained with fuchsin.

Large individuals: Length from pole to pole, 1.6 μ; medium width, 0.8 μ.

Small individuals: Length from pole to pole, 0.8 μ; medium width, 0.6 μ.

The fissure which separates the two individuals makes a part of a clear zone surrounding the elements, which has given rise to the belief in the existence of an amorphous capsule not colored by the reagents. This interpretation of the appearances is contested.

The *grouping* of the gonococci in heaps is characteristic. It results from the disposition of the pair of gonococci, each individual of which subdivides in turn to form a new couple. Hence the groups, in which the individuals are not pressed together in clusters like staphylococci, nor disposed in chains like the streptococci. It results, also, from this division, that the number of individuals always remains even and often forms a multiple of four.

The *intracellular situation* of the gonococcus when it finds itself in the pus, is one of its most important characteristics. It is encountered in leucocytes which are at times literally filled out to the point of bursting. These leucocytes are found alongside of others which have remained healthy. The nucleus is never invaded by the gonococcus. From this intracellular multiplication the typical form of rounded groups results, which are seen in the pus when the cell-wall ruptures. We find them in

the specimens as groups surrounding a nucleus without a cellular contour being appreciable. The presence of gonococci in the leucocytes seems to be due to a phenomenon of phagocytosis. Epithelial cells are often covered over with groups of gonococci; in sections of tissue they are sometimes found in the interior of endothelial cells capable of phagocytosis.

III. CULTURES. — Since the time when Neisser discovered the gonococcus, numerous experimenters have attempted to cultivate it. Bumm was the first to obtain positively certain results. He inoculated human serum, and it was upon this medium that he was able to cause pure cultures to develop which could be inoculated in man. Since this time innumerable attempts have been made with culture media of the most variable nature. Human serum mixed with agar constitutes, at the present time, the practical medium for the culture of the gonococcus. This micro-organism either does not grow at all or grows poorly on ordinary media.

[Recent experiments have proven that the gonococcus does not grow on ordinary media. It requires a neutral or slightly alkaline medium. Heiman particularly warns experimenters not to put the inoculated culture tubes in the ice chest as the gonococcus dies there quickly. He holds that the most favorable culture medium is liquid chest serum obtained from a serous pleuritic effusion, or hydrocele serum in nutrient agar in the proportion of 1 to 3. The serum of course must undergo fractional sterilization from six to eight days, and after an interval of two or three days it should be sterilized again on three consecutive days.]

We can not here give all the details of culture of the gonococcus, which, in practice, should be reserved for strictly special cases. We may say, however, that cultures of the gonococcus are distinguished by particular characters which render their confusion with other micro-

organisms difficult. They show little tendency to exuberance and die quickly.

IV. Biology of Cultures.—The gonococcus requires an alkaline medium. It does not grow at ordinary temperature; the temperature most favorable seems to be about 36° C. At 39° C. the colonies die within a few hours. Below 30° C. the colonies increase but little. At 20° C. the gonococcus does not die, but it never develops. Below 18° C. it dies rapidly. Cultures, even when placed under the most favorable conditions die, in general, at the end of five or six days. They must be reinoculated every second day.

[The longevity of the gonococcus without reinoculation has since been demonstrated. In the earlier experiments of Bumm a frequent transplantation was necessary owing to the fact that the culture medium—solidified placental blood-serum—was apt to dry quickly. Finger found it living on the twenty-ninth day upon a sealed beef-serum agar tube. Heiman found it on liquid serum plus nutrient broth on the ninety-third day, and on pus-smeared linen he demonstrated its presence on cover-glass preparations on the sixty-sixth day, by the aid of a drop of sterilized water.]

The gonococcus is extremely sensitive to dessication. Various authors have tried the action of antiseptics. Solutions of silver are the most efficacious, ichthyol following them closely. But this action upon cultures has no great importance from a therapeutic standpoint; the mucous membrane furnishes indeed a medium infinitely superior to artificial media, and the gonococcus, hidden in the depth of the tissues, is protected against destructive agents. In the pus the gonococcus is more resistant, and it has been shown that in stains upon linen it retains its injurious properties for a long time; a fact of importance in hygiene and legal medicine. As to the *toxins* secreted by the gonococcus, we have scarcely any data upon their nature, or

even regarding their existence, although certain gonorrheal accidents in man have a decidedly toxic aspect.

[Recent studies of the nature of the gonococcus have shown that it is not only an intracellular and epithelial parasite capable of producing only local and superficial changes in the mucosa, but that it may invade the submucous and subcutaneous connective tissue, giving rise to suppuration and even to subcutaneous abscesses. Again it may be carried by the blood-and lymph-channels to remote regions of the body, causing metastasis in the peritoneum, pleura, endo- and myocardium, and painful affections of the joints. These latter are well known as gonorrheal rheumatism, as inflammation of the synovia of joints, and of the sheaths of tendons as tendo-synovitis. But well known as these facts are, it has puzzled us to find no gonococci in some of these metastases, although they were in causal connection with the gonorrheal process. Wassermann has shown that gonococci produce toxins, that is, products of their metabolism. These toxins are contained in the gonococci cadavers. Schaffer has injected those toxins into the human urethra, causing thereby a catarrhal urethritis of three days' duration with no sequelæ. Scholtz defines these toxins as bacterio-proteins which are retained in the substance of the live gonococci. It can be isolated by filtration after death of the culture, and when injected in the urethra causes an urethritis of short duration, like that caused by toxins contained in the gonococcus cadavers. It may be inferred that these toxins are the cause of such metastasic processes, where painstaking cover-glass and culture examinations do not reveal the presence of gonococci. The toxins in such a case might have been set free by the dissolution of the germs.]

V. INOCULATIONS.—It is experimentally demonstrated at the present day in an irrefutable manner that the gonococcus alone is sufficient to cause a typical urethral blennorrhagia in man.

Attempts to inoculate gonorrhea in animals have given no results. Injected, even in man, into the subcutaneous cellular tissue, it is but slightly injurious and disappears rapidly without causing suppuration.

[The injection of emulsions of gonococci or of pure cultures into the peritoneal cavities, veins, or in the joints of white mice, rabbits, or guinea pigs, has caused inflammation of the cavities so treated, with rise of temperature and loss of weight. Attempts to inoculate the different mucous membranes with the virus have proved futile. The gonococcus, therefore, introduced in animals acts in a toxic and not in an infectious way.]

VI. CLINICAL STUDY OF THE GONOCOCCUS.—When the gonococcus is introduced into the male urethra it does not find an absolutely sterile field. The anterior urethra is, on the contrary, normally inhabited by a numerous microbic flora, especially in the neighborhood of the meatus, where a large number of micro-organisms are to be found. These microbes are not habitually pathogenic, but their virulence may at certain times be increased, and they may then play an important role in urinary pathology.

In a healthy urethra the gonococcus never exists. We may here find diplococci which present certain analogies of form. But the *form*, the *dimensions*, the *grouping*, the *intracellular* situation of the gonococcus, and especially its properties of being decolorized by Gram's method, are distinctly characteristic. As soon as the gonococcus is implanted at a given point of the mucous membrane, it develops there, multiplies, and provokes a reaction in the tissues which constitutes the blennorrhagia or gonorrhea. It then spreads on the one hand by gaining access to a surface, more or less extensive, of the urethral mucosa and of the mucous membranes with which it is continuous; on the other hand by penetrating more or less deeply into the depth of the tissues.

An attempt has been made to study the manner in

which the gonococcus behaves in regard to the epithelium and connective tissues.

Epithelium.—The course of the gonococcus in the epithelium of the mucous membranes has been studied by Bumm, Orcel, Touton, Jadassohn, Finger, and others.

Bumm has shown that the gonococcus rapidly traverses the epithelium of the conjunctiva. According to this author, it does not ordinarily penetrate other than the cylindrical epithelium, never the resistant pavement epithelium, and but to slight extent the connective tissue.

Touton, Jadassohn, Fabry, Dinkler, and Rosinsky have shown that the gonococcus multiplies on the surface of the pavement cells, only penetrating between the most superficial without reaching the deep layers or the mucosa.

Finger has demonstrated by autopsy made after experimental inoculation, that the gonococci begin by proliferating on the surface of the epithelium where they are united in small groups. Then, at the end of thirty-six hours, they glide in between the superficial cells at the points which present the least resistance. They rapidly invade the lumen of Morgagni's lacunæ, where they are found free upon the surface of the epithelium. Diapedesis begins, the leucocytes gain the surface of the mucous membrane, and gonococci are already found within the leucocytes.

Changes in the epithelium depend upon the nature of the latter. The gonococci scarcely penetrate into the stratified pavement epithelium, and the leucocytes encased between the cells contain none.

In the cylindrical epithelium they are especially abundant in the neighborhood of the glands, where they fill up the pus-cells and pass through the epithelial layer in long thread-like chains; the same is true of the walls and of the stratified epithelium of the bottom of the lacunæ where they are, however, much less abundant. Finally, they are again found in the excretory ducts of the glands, but

they are never seen to insinuate themselves between the secreting cells.

We thus see that the gonococcus penetrates, by preference, the cylindrical epithelium of the urethra, especially in the vicinity of the glands. If the pavement epithelium does not offer it an absolute obstacle, it at least opposes a marked resistance.

Connective tissue. — Bumm has shown that, in ocular blennorrhagia (opthalmo-gonorrhea), the gonococcus invades the connective tissue to a slight degree only.

Touton (1889), Jadassohn, Neisser, and others think that it never reaches this tissue. Frisch, however, in two instances of rectal blennorrhagia found the gonococcus in the glands and interglandular tissue. Wertheim has seen it penetrate through the tubes and the peritoneum ; Pellizari has observed it in periurethral abscess ; Horwitz demonstrated its presence in pure cultures in an abscess of the hand. Finally Crippa found it in edema of the prepuce coming on eight days after infection.

To sum up, the gonococcus is a microbe of the mucosa, its habitat of preference is the cylindrical epithelium, but it may also penetrate the other varieties of epithelium and even reach the connective tissue. In the latter case it becomes but mildly pyogenic.

VII. Extension and Generalization.— 1. The gonococcus may develop primarily on the surface of the urethral, the conjunctival, the vaginal, or the rectal mucous membranes. We, likewise, observe in the new-born, instances of blennorrhagic stomatitis and rhinitis.

Finally, it may spread by direct propagation to the whole extent of the genital and urinary organs of the male and of the female (urethritis, cystitis, pyelitis, nephritis, Cowperitis, prostatitis, spermato-cystitis, epididymitis, vaginitis, vulvitis, Bartholinitis, metritis, salpingitis, ovaritis, peritonitis).

2. The gonococcus can also penetrate into the blood-

current and set up special inflammatory disturbances in organs far away from its point of entrance. These complications of gonorrhea have been observed in the endocardium and in the articular and visceral serous membranes. Certain neurites and myelites have likewise been attributed to the influence of the same micro-organism.

VIII. PERSISTENCE AND INCREASE. — In the internal organs and in the articular and visceral serous membranes, the gonococcus generally disappears rapidly; perhaps by reason of the fever which it has caused, and to which it can offer no adequate resistance. Upon the mucosa, on the contrary, it shows a marked tendency to establish a domicile and to persist for a long period in a latent state in giving rise to chronic manifestations. It is difficult to establish accurately the rôle of the gonococcus and its ultimate fate in chronic urethitis. They have been found still to persist at the end of six years and even longer. It seems that under these conditions, after a lengthy period of reproduction upon the same soil, their virulence becomes attenuated, so that they no longer provoke any but slow reactions of chronic nature in the tissues. They can thus remain indefinitely in the surface of the mucous membrane and in the orifices of the glands.

However, when they have reached this state of virulence, in a measure latent, they may, under the influence of some irritating cause, readily start up a fresh growth upon this same soil, and reproduce an acute recurrence. Furthermore, if transported upon another mucous membrane, whether it be in the same individual or in another subject, they are capable of here developing afresh an acute gonorrhea with all its consequences.

[Cushing (Bulletin of the Johns Hopkins Hospital, 1899, p. 75), reports two cases of acute diffuse gonococcus peritonitis in two women where the gonococcus was found in the exudate on performing laparotomy. Examination of the vaginal and urethral discharge was negative. In each

case the peritonitis developed during menstruation, following an exposure to infection. Cover-glass examination showed the presence of gonococci, and cultures developed diplococci which were decolorized by the Gram method. Before we understood the rôle played by the toxin of the gonococcus, such inflammations had been regarded as the result of mixed infections, as no gonococci could be found in the exudate. These cases seem to establish for the first time convincing evidence of a peritonitis caused by the gonococcus.

It seems significant and interesting, from an etiologic standpoint, that these two reported cases happened during the time of menstruation. This will recall to the mind of the practitioner such cases of peritonitis in the puerperal state where, in spite of the most minute asepsis and an uneventful delivery, septic peritonitis has set in. Likewise cases of para- and perimetritis will be remembered that have started with the onset of menstruation and have been attributed to taking cold, to a strain, and to other such unproven incidents. There was always, and there is yet, a suspicion in critical minds concerning the origin of these exudative pelvic inflammations. In the light of the ubiquitousness of the gonococcus, and the obscure and circuitous ways of its acquisition, it is perhaps not too hazardous to maintain that a goodly part of ascending pelvic inflammations, unrecognized as to their etiology, are due to gonococcal infection, either by the coccus itself, or by its toxins. The puerperal and menstrual states, with their attendant congestive conditions, might create an especially receptive medium for the propagation and invasion of dormant or, as the case may be, of a recent and active brood of gonococci. Furthermore, the life-history of the gonococcus is of such a retributive character that it stops short at nothing. A man affected with chronic gonorrhea of a form so slight as to be unconscious of its presence, may become refractory to his own gonococci. But trans-

planted to a new soil they will become virulent in the vaginal mucosa of their new host. By this implantation on a new culture-medium, the gonococci may again assume a degree of virulency which, in turn, is capable of infecting the man who bore ancestors of such gonococci with immunity. By some as yet unknown biologic transformation they become alien to the soil they have inhabited before with immunity to its bearer. It is evident, therefore, that a woman with an exudative para- or perimetritis, acquired from a latent chronic gonorrhea of a man, may be able, after sexual relations have been resumed, to infect that man with just as virulent a type of gonorrhea as if acquired by any impure illegitimate intercourse. Such a condition may become embarrassing to matrimonial life from a moral and legal standpoint. The physician who is well acquainted with all these possibilities of gonococcus life, will be able to explain and to redeem a seemingly lost reputation.]

Thus it is of the highest importance to determine the moment when gonococci have disappeared from the urethra. Unfortunately they are found only in an inconstant manner in chronic gonorrhea, whose morbid products (secretitious urinary filaments) may contain none, while they may persist in the chronic lesions. Certain lesions may even produce no secretion. Therefore, one cannot jump at the conclusion that the gonococci have disappeared. When a series of microscopical researches, conscientiously carried out, have failed to show any trace, we may see a recurrence take place under the influence of some ordinary cause, and the gonococci may at once show active development.

Furthermore, the lesions of chronic urethris have a strong tendency to continue their evolution over a period of years, generally even, unless arrested, during the patient's whole life. Undoubtedly, we may admit that, in certain cases, this tendency to keep up the irritation may

be due to external causes, even, for example, to inappropriate treatment. Still we must not forget that this particular tenacity of chronic urethritis, this tendency which the lesions possess of spreading out without cessation and invading neighboring areas, can scarcely be understood, unless we admit that gonococci, which have become almost inert, hidden in the depth of the tissues, continue to provoke in them a slow chronic reaction, but one sufficient to perpetuate the disease, and even to permit of its transmission.

IX. SECONDARY INFECTIONS.—When the gonococcus invades the urethra we observe a more or less complete disappearance of the other micro-organisms which normally inhabit it. These micro-organisms subsequently put in a reappearance as the gonococcus becomes weakened; but the changes in the urethra caused by the gonorrhea create in it a sort of special receptivity for these microbes which, in general, are without influence upon the tissues.

Thus are explained the instances of urethritis without gonococci, which are occasionally observed after coitus in cured gonorrheas, and which rapidly disappear under mild antiseptic treatment.

CHAPTER III

ACUTE URETHRITIS

CASES in which a study of the pathological anatomy of acute urethritis has been possible are not very numerous.

We knew only of few autopsies which had been carried out upon those who had accidently died a few days after having contracted clap, up to the time that Finger practiced his experimental inoculations upon moribund subjects, making it thus possible for him to examine the urethral mucosa thirty-six to forty-eight hours after the onset of urethritis.

Finally, the studies made by endoscopists, as well as the works of Touton, Neelson, Brissaud, Segond, Wasserman, and Hallé upon chronic urethritis, compared one with the other, permit us to understand in the following manner the anatomical evolution of gonorrhoic urethritis.

The gonococcus implanted at a given point of the urethral mucous membrane develops, as we have already seen, in the epithelial layer, which it invades by continuity, multiplying in the neighboring cells situated upon the same plane and penetrating rapidly into the deeper epithelium. During this period no symptom is manifest; it is the period of incubation of the disease.

Having thus arrived at the mucous membrane, it here sets up an inflammatory reaction absolutely similar to other inflammations; the vessels become turgescent, there is abundant diapedesis of leucocytes, production of embryonal cells, phagocytosis becomes established, and suppuration begins. The epithelium, already altered by the first efforts of the parasite, is destroyed still further by the

passage of the leucocytes, which become infiltrated in the interstices of the cells; it desquamates abundantly, and ends by disappearing in areas, leaving the mucous membrane exposed. In certain very acute cases this desquamation is so very rapid, and the inflammation of the deeper strata of the mucous membrane is so intense, that they give rise to the formation of false membrane.

The submucosa itself, under the influence of inflammation, gets abundantly infiltrated with embryonal cells. At times this infiltration is limited to the superficial layers of the mucous membrane, at other times it invades the whole thickness. The mucous membrane is then thick, friable, loses its elasticity, and bleeds readily. (Clap with chordée.)

At times the inflammation goes even deeper and reaches the muscular layer and the spongy tissue; the sheaths of the corpora spongiosa swell up; extensive embryonal infiltrations are produced; the arteries present lesions of endoperiarteritis; the veins, attacked with phlebitis, enclose here and there fibrinous coagula. The lymphatic vessels are likewise invaded; the inguinal glands swell up, become sensitive, and at times even suppurate. Finally the urethral glands participate actively in the inflammation. This participation is especially important because we find it playing a major part in chronic gonorrhea. The internal surface of their excretory canal becomes the seat of an abundant epithelial proliferation, while their walls thicken and undergo embryonal infiltration. It is especially about these glands that we find extension of the inflammation to the spongy bodies, and even to the cavernous tissue. The glandular inflammation results often in a sclerous retraction, or in an obliteration of the excretory duct with formation of a cyst. These inflammatory phenomena are observed in the fossa navicularis where the infection is first of all established, and is propagated over a more or less considerable extent of the urethra, according to the

virulence of the infection and the resistance of the subject. The inflammation thus extends up the whole length of the urethral mucous membrane, but its intensity decreases in proportion as we advance from the point at which inoculation has occurred, as is observed in all local infections. It naturally follows that gonorrhea may remain limited to that portion of the urethra situated in front of the external sphincter or, on the other hand, pass this sphincter and reach the posterior urethra. The observations carried out at the Necker school have brought out in an excellent manner the clinical importance which this extension acquires in the posterior urethra. Once having reached this region, the symptoms change entirely, and the blennorrhagia may continue its upward march, invading the bladder and kidneys, or the prostate, seminal vesicles, and epididymes. The invasion of the posterior urethra is thus a marked feature in the pathology of gonorrhea.

What is the rôle here played by the external sphincter? Guyon attributes to it the power of arresting the march of urethritis, which should thus be localized *anterior to it*, else when it has passed it, it would find the way which leads to the various complications of the disease widely opened and without defense. However, if we note that the epithelium and the mucous membrane are continuous in the whole length of the urethra, we cannot attribute to a simple sphincter, however powerful it may be, the ability to arrest the course of so virulent an affection as that produced by the gonococcus. It would seem rather that according to the degree of virulence of this infection and the resistance which the subject may oppose to it, the blennorrhagia may spread to a more or less distant point, as all local infections do, and invade the urethra only in its more anterior portions or in its whole extent.

Acute posterior urethritis should not, therefore, be considered as a complication, as it is of quite frequent occurrence. Finger finds it in fifty to eighty per cent of cases

(diagnosis by irrigation test). Jadassohn in sixty to seventy per cent of cases. Other authors give similar figures.

At the end of a few weeks, moreover, especially under the influence of a rational treatment, the gonorrhea tends to retrogress. The gonococci diminish in numbers, the phenomena of phagocytosis becomes less intense, the embryonal infiltrations become, at least in part, resorbed, the vascular phenomena of inflammation diminish, and the epithelium which has been destroyed tends to become regenerated.

But there is never restitution *ad integrum*, and the epithelium, notably, never again takes on its normal cylindrical form. Besides, the gonococcus hidden in the depth of the tissues and in the glandular cavities does not disappear completely in so short a time, and its presence *within certain lesions*, which persist, impresses upon the latter a special mark, and *gives to them a characteristic course which constitutes chronic gonorrhea.*

CHAPTER IV

PATHOLOGICAL ANATOMY OF CHRONIC URETHRITIS

THE anatomo-pathological alterations of chronic urethritis, easily recognizable during life by means of the urethroscope, become, on the contrary, often invisible when they are sought for upon the cadaver.

The phenomena of local congestion, the edema and the swelling, disappear after death; while the lesions which persist are generally so minute that it is difficult to recognize them with the naked eye.

By an attentive examination we may, however, discover a certain number of alterations in the mucosa and of the epithelium which we will now pass in review.

On the surface of the epithelium we frequently note small, whitish plaques analogous to epidermic cicatrices, and which are due to a local thickening of the layer of epithelial cells (xerosis). We scarcely ever find those ulcerations or losses of substance which the older authors describe. Still quite frequently we meet small nodules of pin-head size, due to the obliteration and cystic transformation of the Morgagni lacunes and Littre's glands; at other times these lacunes and glands have a largely gaping orifice, extending slightly above the level of the mucous membrane.

The mucous membrane presents scarcely any alterations appreciable to the naked eye. The embryonal infiltrations and even the lesions of sclerosis, so clear on microscopic examination, are not visible unless they are of excessive development (strictures). The existence of granulations is, however, made out when deep-seated in-

filtrations raise up the surface of the mucous membrane and give to it a dull aspect, or when numerous glandular lesions exist localized at a given point.

In a word, the macroscopic examination of the urethra in the cadaver gives only vague and altogether insufficient information concerning the chronic inflammatory processes that the microscope can bring to light.

On the other hand, the *microscopical changes* are extremely interesting and their study is of the utmost importance.

We shall examine successively the histologic changes of the epithelium, of the submucous tissue, of the lacunæ, and of the glands of the urethra.

The *epithelium* has a well-marked tendency to pass from the cylindrical to the flat and even horny variety of epithelium, and we may also find intermediary types between these two extremes. The cells of the superficial layer begin separating and undergo mucous transformation; the cells situated immediately underneath proliferate and are strewn with numerous leucocytes. Little by little the transformation is effected. The superficial cylindrical cells become first cubic, then more and more flattened. According to Wassermann and Hallé, the transformation into pavement epithelium may be quite clear without there being superficial cornification. We then find simply a superficial layer of flat cells reposing upon one or more layers of polygonal cells and one stratum of cubic cells. But generally the changes are more pronounced and the epithelial transformation is more complete.

Neelssen, as well as Finger, believes that the nutrition of the epithelium is interfered with by the fibrous transformation of the subjacent mucosa, while Baraban denies the importance of this factor. However this may be, most often the epithelium takes on the epidermic type described by Hallé and Wassermann. We find a superficial layer of corneous cells reposing on a layer of lace-work-like poly-

gonal cells (Malpighian net-work). The lower stratum of cubic cells still persists. Finally all differentiation is lost. The epithelium, which lies now on a mucosa transformed into fibrous tissue, takes on the aspect of cicatricial epithelium, and is made up solely of a few layers of flat cells. These alterations are encountered in all the portions of the urethra. They are, however, more frequent in the anterior urethra.

The mucous membrane presents the most important lesions. It is here that the real processes of chronic inflammation which we are studying take place. The first phase of this process, at the time the acute form passes into the chronic, is characterized by the existence of a more or less abundant inflammatory infiltration of embryonal uninuclear cells, of pus-corpuscles, and of epitheloidal cells. This infiltration may be so abundant that the submucosa entirely disappears. Wassermann and Hallé have seen, at the posterior part of a stricture, a mucous surface deprived of epithelium, in which the mucosa was only a collection of small round cells with numerous capillaries of new formation.

Usually the infiltration is not so abundant; it is not generalized, but forms plaques of variable extent and depth, surrounding, by preference, the lacunæ and the glands. It is accompanied by an abundant vascularization, due to the formation of new capillaries. It results from this that the surface takes on at certain points a granular aspect, sometimes forming papillæ or veritable vegetations either simple or ramified.

As in all chronic inflammatory processes, this embryonal infiltration is organized into fibrous tissue; it first becomes richer in fusiform cells, then little by little takes on the texture of true cicatricial tissue, the final stage of an evolution of which all the intermediary steps are well recognized. Often in the same individual we find different forms united in a single area.

In the center cicatricial tissue, and then concentric, or at least successive zones in which the embryonic infiltration is more and more marked.

This appearance naturally indicates that the lesions at first bounded by circumscribed limits have a continual tendency to spread by new exacerbations and to invade, little by little, the healthy tissues.

We have seen that the lesions are especially marked around the lacunæ of Morgagni and the glands of Littre.

The *lacunæ* are only depressions in the mucous membrane, having the same structure as the latter and showing, in consequence, the same lesions.

The infiltration of the perilacunar tissue by leucocytes, and the vascular dilatation which accompanies it, produce a swelling of the lacunæ and a crater-like projection of their orifices.

The consecutive fibrous transformation is shown in two ways: At one time the lacunæ retract, become atrophied and disappear; at another, on the contrary, the orifice becomes obstructed; they then fill up with cellular debris and are transformed into cysts which appear upon the surface of the mucous membrane in the form of whitish nodosities. Finally they may suppurate and give rise to periurethral abscess and subsequently to fistula; but this suppuration, which is quite frequent in acute urethritis, is rare in the chronic form.

In regard to the *glands of Littre*, where we have seen the acute gonorrhoic process to be the most deeply marked, we again find in the chronic form analogous tendencies. Here, also, it is in the gland and in its immediate neighborhood that the lesions of infiltration are the most manifest.

In the gland, the lesions may take on various forms: At one time the secretion is increased, and the gland swollen, at another, small cysts form and fill with colloid material, or the cellular proliferation, observed at the surface of the mucous membrane, reaches the acinus, undermines the

cylindrical epithelial covering, insinuates itself between the latter and the basal membrane and destroys the acinus in filling the gland with epithelial debris. (Hallè and Wassermann). At still other times the gland, choked by the retraction of the surrounding fibrous tissue, is slowly destroyed.

Finally, just as in the case of the lacunæ, it may be invaded in an acute attack, suppurate, and give rise to follicular abscess. As to the periurethral *spongy tissue*, it does not, in general, participate in the chronic inflammatory process; the Littre glands, however, which are found here, are invaded and form in the midst of the intact tissue small sclerotic nodules.

It happens, however, that the erectile tissue becomes invaded by the same changes as the mucous membrane, and that a chronic periurethritis develops, passing through the same phases of round-cell infiltration, and then sclerosis, as the mucous membrane itself. These infiltrations, nearly always limited to small foci, are accompanied by endoperiarteritis of all degrees in the large arteries of the spongy body. The circulation is obstructed; the spongy spaces, compressed by the fibrous retraction, disappear, and there remains only a firm cicatrix, more or less extensive, encircling the urethra like a ferrule. The same lesions may also be encountered in the cavernous bodies where they are produced in the same way and go through their evolution in an identical manner.

In the *posterior region of the urethra* the lesions are of the same nature and pursue a similar course. Here we found the same epithelial changes and the same modifications of mucous membrane, small round-cell infiltration with tendency to fibrous organization; but these changes are, in general, less marked here than in the anterior urethra.

Besides, we find here some special features which are due to the anatomical and physiological conditions peculiar to each region.

In the membranous region, the walls of the urethra, rendered rigid by sub-epithelial infiltrations and subjected to the energetic action of the sphincter muscles, split open or fissure, and we can frequently make out the existence of more or less deep rhagades with red, easily bleeding bases, cutting into the infiltrated tissue. These ulcerations, by reason of their subsequent cicatrization, are one of the most frequent causes of stricture.

In the prostatic region acute urethritis is frequently accompanied by follicular abscesses which open into the canal of the urethra, and then cicatrize in giving rise to formation of small callosities. The infiltration of the verumontanum may terminate in the same manner, producing a dense fibrous tissue which changes the aspect of the mucous membrane. The callosities thus formed compress and obliterate the ejaculatory ducts. The infiltration extends along the ducts whose walls become rigid and gaping. The prostatic glandules are attacked in the same way as the glands of the anterior urethra, and become the seat of a mucous, muco-purulent, or simply purulent catarrh, or the periglandular infiltration brings about their necrosis and destruction. But these lesions of the ejaculatory ducts and of the prostate are already outside of the category of simple chronic urethritis. Besides, the posterior region is poor in glands of Littre and does not possess the lacunæ of Morgagni.

This is the explanation of chronic urethritis in this region being less deep-seated, and consequently less tenacious; when it persists, it does so because it is accompanied by prostatic lesions or some form of complication.

To resume: When gonorrhea attacks the urethra it begins in the region of the meatus and invades the canal over a considerable extent, according to the resistance of the subject, the virulence of the disease, and the particular circumstances which more or less favor extension.

It produces, in the urethral tissues, an abundant cel-

lular infiltration. In the acute stage this infiltration is manifest by suppuration and discharge. In the chronic stage it tends to limit itself to circumscribed areas around the glands and lacunæ, to become organized into fibrous tissue. From this numerous lesions result.

The epithelium flattens and tends successively to take on the structure of pavement epithelium, of epidermis, or of cicatrical horny tissue.

The mucous membrane is especially invaded along the course of the diverticula and the glandular ducts which traverse it. It loses its elasticity, and then retracts in being transformed into firm fibrous tssue.

The glands are attacked with mucous or purulent catarrh. They may even become obliterated and give rise either to the formation of small cysts, or of abscesses, which open and cicatrize in leaving behind fibrous callosities. Finally they may become choked by the retraction of fibrous tissue which surrounds it and disappear without leaving any traces.

The periurethral tissues are only rarely attacked. They present the same alterations and also end by undergoing fibrous transformation.

PART SECOND

DIAGNOSIS

DIAGNOSIS of chronic urethritis is based upon:

1. The symptoms of which the patient complains.
2. The results furnished by the objective examination.

The symptoms which attract the patient's attention are, in the first place, the *suppuration*, which shows itself under the form of a discharge, or of shreds in the urine, and then of functional disturbances and *abnormal sensations*, which are felt in the canal or in the neighboring organs.

The objective examination of the canal includes the employment of *palpation*, *of sounds*, *of urethrometers*, and of the *urethroscope*.

The *subjective symptoms* necessarily vary very much according to the nature, the extent, and the seat of the lesions, and also according to the susceptibility of the patient. In this respect there exists no fixed rule; while it frequently happens that the symptomatology is in direct line with anatomical lesions, that is to say, if the symptoms of which the patient complains indicate quite accurately the true import of the changes present, we also frequently observe just the opposite. Benign lesions at times accompany very pronounced symptoms, while grave lesions, on the other hand, occasion but the slightest derangements, and they may even exist for a long time unnoticed. Therefore, while taking into account the symptoms which may be more or less freely described by the patient, the physician should never neglect to make a complete objective examination if he cares to arrive at

a knowledge of the actual existence of lesions, their nature, their location and their extent. [Diagnosis of chronic gonorrheal urethritis is made up like all diagnoses of different but convergent attributes. But nowhere does it carry the character of a composite picture with more right than here. The subacute, the latent form, or a recent exacerbation may, one or all, contribute to create a complexity of symptoms quite embarrassing at first; but, fortunately, we are enabled by the systematic use of the means at our disposal, which will be found elsewhere in this work, to locate and properly treat these affections.]

CHAPTER V

SUPPURATION

SUPPURATION is the symptom most frequently observed; it is often the only one which preoccupies the patient, and oftentimes, also, the only one which disquiets the physician. We will see, however, that some forms of chronic urethitis exist in which we do not discover any apparent trace of discharge, at least for a very long time.

I. THE QUANTITY OF SECRETION furnished by chronic urethritis depends upon the nature and extent of the lesions. When it is very abundant it causes a continuous oozing which is the more apparent the longer the patient refrains from urinating. The discharge is also considerable in the morning, because of the period passed in sleep, and the genital congestion which results from prolonged rest in bed. It shows at the meatus, either spontaneously, or after pressing out the canal with the finger, as a drop, commonly known under the name of *goutte militaire*. This drop has a greenish-yellow, whitish, grayish, or clear color, according to the composition of the discharge. At other times the suppuration is not sufficiently abundant to produce a drop; the slight amount of secretion which appears at the meatus dries, agglutinates the borders of the canal and gives what is called the *glued meatus*. Finally, if the exudate is produced in too small a quantity to appear as an external discharge, and remains adherent at the point where it is formed, the first jet of urine detaches it and washes it out; it then appears under the form of threads (*Tripperfäden*), more or less numerous, more or less thick and heavy, floating in the urine.

These filaments, according to their composition, are of variable aspect. At times, large and heavy, they soon fall to the bottom of the vessel; at others they float for a considerable time. They are thin and elongated, or small and short, fluffy or compact, or at times they may resemble minute shreds of cotton. Fürbringer attributes to them a particular form—comma shape—when they come from the posterior urethra.

The presence of the urinary filaments constitutes one of the most frequent symptoms observed, and one of the best known in chronic urethritis.

We have already said that the suppuration is at times sufficiently abundant to form a veritable discharge; at other times, on the contrary, it shows in quantities so small that it is perceived only under the form of small flocculi which swim in the urine. In general, the suppuration diminishes according as the patient's condition improves; but chronic urethritis often presents acute exacerbations during which the discharge is seen to reappear; the course of the disease is thus marked by successive phases, during which suppuration increases or diminishes. Acute exacerbations are often attributed to excesses, at times, to the effects of treatment, and they may even occur without known cause. When they are violent they constitute relapses, and their symptoms become sufficiently intense to call to mind the acute period.

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II. MICROSCOPICALLY, the secretion of chronic urethritis comprises different elements associated in very variable proportions. These are mucus, epithelial cells, leucocytes, and microbes; one or more of these elements may be absent or, on the other hand, may predominate.

a. Mucus comes from catarrh of the mucous membrane, from hypersecretion of glands in the diseased areas and, probably, also from the mucous degeneration of epithelium. It exists at times alone, forming a clear and limpid discharge, slightly viscous and sticky, and generally holding in suspension other elements of the discharge.

b. Epithelial cells which have been divided into several groups:

1. Large pavement epithelial cells, arising simply from desquamation of the superficial layers of the altered mucous membrane.

2. Transition epithelial cells—round, oval, polygonal,

FIG. 4. SECRETION OF CHRONIC URETHRITIS FROM "MORNING DROP." *M*, mucus; *E*, epithelium; *B*, bacteria (streptococcus, staphilococcus and different diplococci); *L*, leucocytes.

fusiform, bent, or having large nuclei, arising from regions where the epithelium proliferates abundantly.

3. Cylindrical cells, arising either from the healthy portions of the canal or, when they are in superimposed layers, from the prostatic glands.

4. Hyaline cells, to which Fürbringer has given the name iodophilic cells, because of the ease with which they are colored by iodin reagents; they are also met with in the normal urethra.

5. Cells which have undergone fatty degeneration. These last are quite rare.

c. Leucocytes give to the discharge its purulent aspect; they are polynuclear and, aside from this, have no special characteristic.

d. Micro-organisms may be entirely absent in certain shreds or threads which are, in this case, *aseptic*. Generally the urethra is inhabited by a rather rich microbic flora, of which various specimens are found in the discharge—micrococci and bacteria of every description. These microbes have, as far as we know up to the present time, no importance. As to the gonococcus which gives to the disease its special feature, we do not invariably find it. It even happens that it escapes repeated and minute examination, and that, a relapse coming on after one or another cause, it appears in large numbers. It is therefore necessary not to attach to the search for it in a given case the decisive importance which is frequently attributed to it; we can never conclude that the disease has lost its contagious nature, even after we have failed to find gonococci present in repeated and carefully made examinations. (See Chapter XV.)

Besides these morphological elements, which are habitually present, we may also find others which depend upon a complication of the disease. Such are the red globules encountered especially when an acute recurrence of a posterior urethritis takes place, spermatozoa, and debris of various kinds.

III. LOCALIZATION.— The microscopic examination of the products of suppuration gives no information as to the portion of the canal in which the process has taken place. We cannot distinguish pus formed in the posterior urethra from that which forms in the anterior part of the canal.

This distinction would, however, be of importance, because posterior urethritis demands quite a different treatment from that of the anterior portion.

In face of this insufficiency of direct examination, we should resort to indirect methods, which we shall describe and which are based upon the same principle.

The urethra, from a physiological as well as from an anatomical point of view, is divided into two quite distinct segments separated from each other by the external sphincter muscle. The tonic contraction of this sphincter is very energetic and generally closes the urethra in an almost hermetical manner. It results from this that all liquids introduced into the canal this side the sphincter are at once projected toward the meatus by the elastic pressure of the walls. On the contrary, liquids introduced beyond it flow toward the bladder and become mixed with the urine. This rule, exact from a physiologic view, is perhaps not absolute; we see quite frequently, in spite of the action of the sphincter, that pathological fluids pass from the posterior region to the anterior region and show themselves at the meatus.

Hence the procedures based upon the sphincter action have only an approximate value. We shall describe them presently.

a. Two-glass test (Thompson). The patient retains his urine long enough to accumulate in the urethra all the secretion possible. At the moment of urination he passes the fluid into two glasses. The pus which may have been in the urethra will be washed out by the first flow of urine, and will be found exclusively in the first glass. The urine contained in the second will be absolutely clear; but, as the pus formed in the posterior urethra flows into the bladder and there mixes with the urine, if a posterior urethritis exists, the contents of the second glass will be turbid.

b. Three-glass test (Jadassohn). The patient urinates successively into three glasses. The first contains the pus still adherent to the walls of the canal; the second glass, in case of posterior urethritis or of cystitis, will contain the secretions which have flowed toward the bladder and mixed with the urine ; finally the muscular contractions which mark the end of micturition press out the contents

of the posterior urethra, and cause to escape, especially from the prostate, all the pus which may have accumulated here; this pus will be found in the third glass.

From this there are three possibilities:

1. If the first glass alone holds purulent urine, *anterior urethritis.*

2. If the second and third glasses also show it, *urethrocystitis* or *cystitis.*

3. If the second glass contains pus, but the third glass holds still more, *posterior urethritis* and *prostatitis.*

But the first glass may also contain threads coming from the posterior urethra. If we wish to eliminate them, we begin by removing them by means of lavage. In this manner the pus which the first glass might contain would certainly have its origin in the posterior urethra, and this diagnosis would be correct even if the urine collected in the second glass was perfectly clear. The secretion of the posterior urethra may indeed be too scant to penetrate into the bladder. Washing out the anterior urethra is best made in the following manner:

A Nélaton catheter is introduced up to the level of the sphincter and, by means of it, a certain quantity of water is injected to the bottom of the anterior urethra. The canal being closed at this point, the fluid necessarily flows back toward the meatus and brings with it all the secretions adhering to the mucous membrane. If we make this lavage under a proper pressure, we obtain good results; if the pressure is too strong, the resistance of the sphincter may be overcome, and the injected fluid penetrates into the bladder, carrying with it the threads which will afterward be found in the urine, and whose presence will lead to a faulty diagnosis. With the view of surely avoiding this inconvenience, we use for washing a solution of iodid of potassium, 1 to 1000. After having collected the urine, we add a few drops of perchlorid of iron. In case the washing fluid has passed into the bladder, the urine takes

on a characteristic bluish color. If it has not passed into the bladder, the urine remains uncolored.

IV. KOLLMAN'S PROCEDURE. — Kollman employs five glasses in his test, which is, by preference, made in the morning before the first urination has occurred. The patient, while standing, has a soft catheter introduced up to the bulb, and lavage is made by means of a syringe. The pressure should be slight for fear of forcing the liquid into the posterior urethra, which, according to Kollman, is easily done.

The washing water is collected into a *first glass*, into which is poured successively all the water which flows from the canal at each washing as long as it brings with it any threads. Once the washing water returns clear this last specimen is preserved in a *second glass*. Now the patient urinates into *three glasses*, just as in Jadassohn's test.

Such are the various processes usually employed in clinical work to disclose the existence of posterior urethritis. They are all based on the rôle played by the membranous sphincter (compressor urethræ); but the tonic contraction of this muscle, be it ever so energetic, forms no absolute obstacle to the passage of small quantities of fluid. This is especially true when the membrane is diseased, and we have constant examples of the facility with which liquids can at times traverse the membranous portion, instead of flowing through their habitual channels. Therefore we cannot attribute an absolute value to the results of urine examination. We may, however, avail ourselves of them in practice, especially when to the results obtained are added those furnished by the other explanatory processes which follow.

[As regards these three tests, they are based on the developmental history of the uro-genital organs, which differentiates the posterior from the anterior urethra. The real closure of the bladder is effected by the compressor urethræ muscle according to this view and not by the sphincter

vesicæ. The compressor urethræ is thought to be in a state of permanent contraction, and when the bladder is distended the sphincter vesicæ gives way and forms, temporarily, a part of the bladder. Thus the so-called neck of the bladder is formed. An analogous condition exists when the os internum of the pregnant womb is obliterated at the end of gestation. Here, too, the internal os and the whole cervix cease to exist when parturition takes place. When a catheter is introduced beyond the compressor urethræ muscle, the fluid injected through it will enter the bladder and will not escape through the meatus in front. Consequently the secretions which form in the posterior urethra will flow backward into the bladder, and those formed in anterior portion in front of the compressor will flow toward the meatus.

Contrary to this view, Zeissl holds quite a different opinion. He emphasizes the fact that, in exercising a pressure on the prostate and seminal vesicles, we find the secretions appearing at the meatus. This could not happen if the compressor urethræ would really form an unyielding barrier between the posterior and anterior urethra. He supports his contention by recent investigations made by Rehfisch, Frankl-Hochwart, and Zuckerkandel, which point toward the sphincter vesicæ as forming the real closure of the bladder. We are not prepared to go into the merits of these different views. There are certainly many points for and against each, and the authors of this volume have therefore cautiously avoided attributing too much importance to the urinary examination alone. But the *two-*, *three-*, and *five-glass tests* serve a very useful purpose, giving a working formula, as it were, and greatly elucidate matters in complicated cases. As to Thompson's two-glass test, its value could be improved if the Goldenberg-Jadassohn modification be more frequently used. It consists of washing out the anterior urethra by means of a short glass or hard rubber tube connected with an irrigating apparatus

previous to urination,—the height of the irrigator being one and one-half meters, and the meatus *not* closed entirely by the tube, which is introduced a little beyond the fossa navicularis. Flushing carried out in this way will not permit fluid to enter the posterior urethra, as was conclusively shown by the prussian blue test employed by Goldenberg after Lohnstein's advice.* In Lohnstein's experiments made for the same purpose, the fluid entered the posterior urethra thirty-seven times out of ninety-four cases. The discrepancy explains itself by the fact that

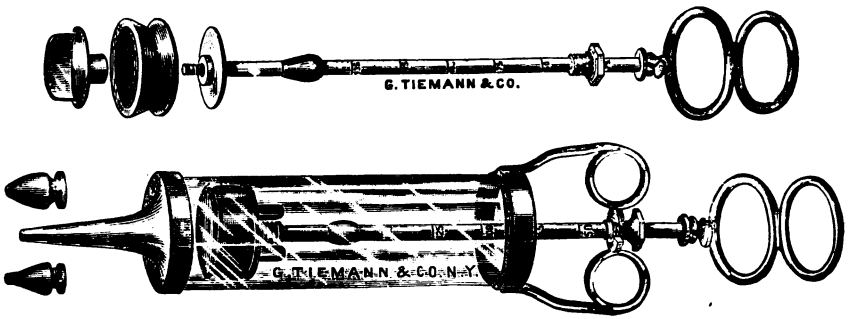


FIG. 5. JANET-FRANK SYRINGE
Can be taken apart and sterilized by boiling. Crystal barrel and nickeled metal casing.

Lohnstein made his irrigations by means of a Nélaton catheter. Goldenberg points out that the mucous membrane contracts about the eye of the instrument, causes the liquid to form a whirl directed towards the bladder, its reflux is obstructed, in consequence of which the compressor muscle relaxes.

We are in the habit of using for this purpose a hand-syringe of a capacity of three to five ounces, and an olive-shaped soft rubber tip (Fig. 5). The pressure can be regulated with more precision by this instrument than with any

*A one-half per cent solution of ferrocyanide of potassium was used for irrigation. If only a few drops of this solution enter the posterior urethra, the first portion of the urine, at least, will give the prussian blue reaction on adding tinct. ferri chloridi.

other. The minutest resistance offered to the ingress of the fluid is distinctly felt in the thumb which governs the forward motion of the piston. We use this instrument by preference for all diagnostic and therapeutic purposes where urethral washings are necessary. We can conscientiously recommend it as the safest contrivance of its sort, having no less a sponsor for it than Guyon, who calls it an "instrument de précision." The fluid used for flushing the anterior urethra is a warm four per cent solution of boric acid. It is preferable to use filtered or distilled water in order to more easily recognize the washed-out threads in the modified Thompson as well as in the original Jadassohn tests. We flush the anterior urethra until the wash-water returns perfectly clear without any threads. The patient is then directed to void his urine into two beakers for Thompson's test, into three beakers for Jadassohn's test, or into five beakers when Kollman's test is to be used. In employing these flushings *without* a catheter and with the use of the hand-syringe and olive-shaped tip, we possess in these modifications an almost faultless means of demonstrating the presence of a posterior urethritis. Of these three tests just named, the latter two will bring forth in their last portions the contents of the prostate or seminal vesicles with reasonable security. The contraction of the bladder at the end of the act of micturition is followed by the continued wave-like contraction of the circular muscle-fibers enveloping the prostate. This latter mechanism, which works almost synchronously with the sphincter of the bladder, will exert compression on the prostatic glands and express the contents of their ducts. These clonic contractions are even capable of emptying clogged glandular ducts and pent-up gonococci, which will then appear in the last portion, i. e., in the second, third, or fifth glass of the tests.]

CHAPTER VI

DISTURBANCES OF SENSATION

THE functional troubles and the painful symptoms of which the patient complains vary extremely in intensity. They depend not only upon the nature and gravity of the lesions, but also upon the particular nervous sensibility of the patient. At one time they are in direct association with the diseased areas; they consist, for example, of a slight tickling or a weak sensation of burning which is produced during the act of micturition, when the affection is located in the anterior urethra. When the posterior urethra is involved, the patient complains of a slight heat, a burning, showing itself especially at the end of urination, and irradiating at times the whole length of the penis; or still again the patient feels a sensation as of a sting at the moment of ejaculation. In the latter case it seems, at times, that changes have occurred in the ejaculatory ducts. When a stricture exists, or even simply a loss of elasticity in the walls of the canal, the patients often complain of a difficulty in urination; at other times, on the contrary, they are tormented by frequent calls to urinate, and they experience a peculiar sensation of incomplete and insufficient miction which is not accompanied by any retention of urine, however slight. This point is easily verified by means of the catheter. These abnormal sensations and functional disturbances disappear in general under the influence of a properly directed therapy, as they are solely connected with the lesions in the canal. They are most marked after excesses and fatigues of every kind.

Furthermore, when the patient presents a more or less marked nervous hyperexcitability, these local sensations become accentuated, not alone to the extent of preying upon his mind already preoccupied, but they extend, at times, with considerable force and intensity into the most varied nerve-territories, and often to those most remote from the seat of the disease. In this case they constitute what is called *sexual neurasthenia.*

Sexual neurasthenia may develop upon a ground prepared by heredity, or even in a subject of habitually normal nervous system, under the influence of general causes which engender all the varieties of neusrathenia.

It is quite generally believed that sexual neurasthenia is occasioned only by lesions of the posterior urethra and particularly by those of the prostate. These organs are, indeed, the seat of an exquisite nervous sensibility, which regulates the different physiological acts of micturition and of coitus. But this sensibility is not caused by those lesions alone which are located in the posterior urethra or in the prostate. Although it may be physiologically called into play by excitations originating in the canal of the anterior urethra, or even outside of the latter in the region of the prepuce or glans penis, for example, it can also be caused in a pathological manner by remote lesions. This is particularly true in subjects of neuropathic taint. In the latter an excitation starting from the glans penis, or from the anterior urethra, will set up an intense desire to urinate. A phimosis or a chronic anterior urethritis will give rise in the same way to sensations whose apparent seat is in the posterior urethra, without the latter being anatomically injured. These sensations may disappear if we act upon the nervous hyperexcitability by means of an appropriate treatment (hydrotherapy, sedatives, etc.), but they reappear almost without fail later on; while a well-directed local treatment will cause a lasting disappearance. The urethroscope frequently confirms this fact,

and we can, in this manner, show that in those subjects affected with severe nervous disturbances, the posterior urethra and its annexes are either but slightly or not at all affected, while the anterior urethra presents manifest lesions. The cure of the latter assures at the same time the complete relief of the patient.

We must further add that if chronic anterior urethritis can of itself give rise to sexual neurasthenia, the same is true of posterior urethritis, while according to our opinion, the last-mentioned case is much less frequent. We may further state that the division of anterior and posterior urethritis, very useful from a didactic standpoint, does not clearly correspond with what is actually observed in practice and that the two forms often coexist; the deepest lesions are generally encountered in the anterior urethra.

However the case may be, the symptoms complained of by the patient may be referred to various regions, and present at times an extremely difficult problem. These may consist in sensations of heat, burning, tickling, pricking, dull pains in the region of the urethra, or of constriction of the glans penis; they may appear in the form of crises which come on either before or during urination. The latter is at times modified by irregular spasmodic contractions of the sphincter or of the vesical muscles. The patient is now conscious of an inexplicable retention, or he experiences a frequent and unjustifiable desire to urinate. The frequent micturitions do not occur during the sleeping hours, which stamps them with a particular character.

As to coitus, the habitual sensations may equally become modified; at times they are diminished and even disappear entirely; at other times, on the contrary, they become exaggerated or altered in character, and even distinctly painful. Nocturnal emissions may occur, or the phenomena of premature ejaculation may constitute an irritable weakness (*reizbare Schwäche*). Again, erections may become difficult or incomplete, the ejaculation is

retarded or does not even occur at all; thus bordering upon more or less complete impotence. Finally, we encounter in some patients spermatorrhea or prostatorrhea often at the time of micturition or more commonly at the time of defecation.

Furthermore, the abnormal sensations which we have described may spread to the neighboring parts, irradiate along the cord, show themselves in the testicles, in the perineum, in the inguinal region, or surrounding the anus. Aside from the symptoms which more or less directly call his attention to the origin of the affection, the patient suffering more or less from sexual neurasthenia may present the symptoms common to general neurasthenia; these we will not here describe, but we will add that at times these unfortunates reach a state of physical and moral depression which leads them to suicide.

CHAPTER VII

EXAMINATION OF THE PATIENT

THE physician called to examine a patient affected with chronic urethritis, should determine with exactitude and precision the nature and seat of the lesions which the subject presents. Indeed a vague diagnosis will not permit us to lay out an efficacious plan of treatment. To reach this indispensable precision, we must employ modes of exploration which are sufficiently delicate. Those generally employed are:

I. DIRECT EXAMINATION.—Direct examination by means of sight or touch may furnish some indications; we see, for example, if there is any discharge or if the meatus is red or inflamed. We may examine by palpatation to discover if there exist along the urethra foci of inflammation which may be recognized by special induration. Foci developed around Littre's glands and their excretory ducts may be made out in the form of small hard pearls, having generally the dimensions of a pin's head. At other times the whole wall of the canal is indurated over a more or less considerable extent, and gives the sensation of a tube with resistant walls. Palpation is best carried out when the walls of the canal are distended by a catheter or dilator; we succeed in this manner, at least in the perineal region, in discovering very clearly the different foci of infiltration, especially when they reach a certain depth in the urethral mucous membrane. These procedures of direct examination by inspection and palpation are naturally insufficient for the examination of lesions situated in the deep urethra. We must here have recourse to exploration by means of instruments.

II. SOUNDS AND URETHROMETERS. — The lesions of chronic urethritis, as soon as they have acquired a certain importance, have the result of modifying the elasticity of the walls of the canal, and generally also the caliber of the latter. If the canal were perfectly cylindrical, we could, in introducing a sound of proper size, perceive a resistance at the diseased points, and thus note their location; but the canal enlarging, on the contrary, as we penetrate more deeply, the slight modifications in the caliber of the deeper parts do not arrest a sound whose dimensions have been calculated from the size of the meatus. It is thus that exploration by means of ordinary bougies does not permit of diagnosticating strictures other than the rather tight ones.

There exist still other causes of error, making this kind of exploration altogether insufficient in the majority of instances. *Bougies à boule* (Fig. 6), give more precise

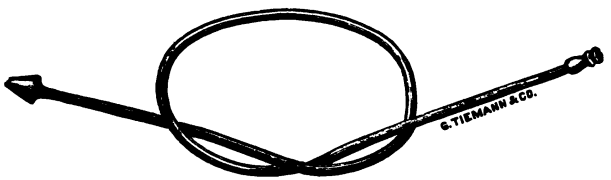


FIG. 6. BOUGIE Á BOULE.

indications. These are small, elastic, thin, and flexible bougies, ending at one extremity in an olive-shaped expansion of definite diameter. It is necessary to have a whole series of such bulbs corresponding to the different numbers of the Charrière scale. To use them it is necessary to pick out one corresponding to the caliber of the meatus, that is to say, one whose bulb penetrates into the urethra in making but very slight pressure. Once the bulb is introduced, it is carried slowly in, so as to cause it to glide the whole length of the canal as far as the bulb. This should be done so that not the slightest resistance is

felt either in entering or being withdrawn. As soon as there is, at a given point, a slight modification of the caliber, this narrowing, even when not pronounced, is indicated by a sensation of a projection, or ledge, which is especially noticeable when the bulb is withdrawn. If a stricture of smaller diameter than that of the meatus exists, the bulb will not pass, and we must select bougies with numbers running smaller and smaller, until we reach one which will pass through the stricture, and thus give the measure of its caliber. When we have reached the membranous portion, the bulb is always arrested by the contraction of the sphincter of the urethra (external sphincter). The patient experiences, at the same time, a more or less violent, painful sensation, followed by a desire to urinate when, the sphincter being passed, the bulb traverses the membranous and prostatic regions.

This process of exploration described by Guyon and employed by him, so to speak, to the exclusion of all other methods, is quite a sensitive test. It permits the discovery of even slightly marked strictures, and enables us to measure their calibre and even their length. If we presume or suspect that a posterior urethritis exists, Guyon advises that a series of to-and-fro motions be carried out in the deeper parts; a sort of sweeping about the canal so as to collect upon the shoulder of the bulb the pus which may be encountered, and bring it to light. But this method, besides being rather painful, is quite untrustworthy.

Furthermore, the procedure is insufficient if the lesions are too diminutive to oppose an obstacle to the passage of the bulb, to indicate their presence by the characteristic sensation on entering and withdrawing the instrument.

Urethrometers are still more sensitive than bougies à boule. The urethrometer most employed is that of Otis (Fig. 7). It is composed of a thin steel stem whose visceral extremity is constructed in such a way as to be

dilated in the form of a spindle by means of a thumb-screw placed at the opposite extremity of the instrument.

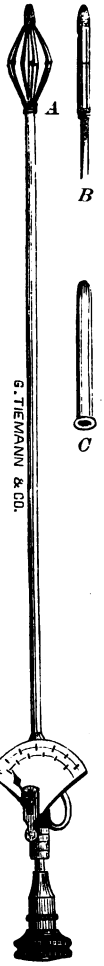


FIG. 7. OTIS' URETHROMETER.
A. Spindle opened.
B. Spindle closed.
C. Rubber cap.

The movements of this screw bring into play at the same time a movable hand set upon a dial-plate marked in degrees corresponding with the numbers of the Charrière scale. The dilatable spindle is covered with a rubber cap which can be readily removed and cleansed; this is intended to prevent pinching of the tissues by the steel joints of the instrument.

By means of this apparatus we can take a very exact measure of the urethra's caliber at its various points, and thus find those in which a chronic infiltration has diminished the elasticity of the mucous membrane.

All the instruments, as well as the methods of examination which we have described, have for their aim the discovery of the exact location of the lesions whose existence has been determined.

Unfortunately, the results obtained in this way are insufficient in many instances, and lack precision. There exist, indeed, a certain number of urethral lesions of very small dimensions which are, however, the origin of serious disturbances. These may be small glands which are inflamed and suppurate, or destroyed cysts in the mucous tissues. Now these lesions, in spite of their restricted dimensions, may produce a long-lasting discharge; they may, on the other hand, not manifest their presence by any symptom over a long period of time. No discharge is seen, no threads float in the urine, but, nevertheless, the patient is affected

with an acute exacerbation without being exposed to any source of contagion. Such instances are frequently encountered and seem inexplicable, and it is thus that chronic urethritis seems at times to assume a mysterious character. The treatment is then directed against an imperceptible enemy who shields himself from view, and whose offensive reappearances upset all our therapy.

It is in such instances that the utility of a more precise and more delicate means of investigation are apparent. In every case, however, we must know in the most exact way the nature of the lesions; it is indispensable, therefore, to possess a method which permits us to constantly follow the phases of the disease and the progress of the cure.

Endoscopy gives us this means. We will, therefore, devote a special chapter to its study.

CHAPTER VIII

URETHRAL ENDOSCOPY (*URETHROSCOPY*)

I. INSTRUMENTS AND OPERATIVE TECHNIQUE.— Before describing the instruments which have been brought to the present state of perfection, it will be of interest to cast a glance over the past. The history of urethral endoscopy is quite a long one. Since the time (1853), when Desormeaux described the instrument which bears his name, and even before his time, many authors had applied their ingenuity to the construction of devices which would permit the illumination of the canal. But all these urethroscopes had one fault in common. It was necessary, in order to obtain the desired light, to fasten a lamp upon the instrument, which made its manipulation difficult and uncertain.

Grünfeld recognized this defect and made an independent source of illumination in employing a fixed light; he used, in succession, an oil lamp, a gas lamp and, finally, an electric lamp. From these he reflected the rays by means of a head mirror into the axis of the endoscopic tube. This simple modification in facilitating the manipulation of the instrument, caused urethroscopy to really enter upon a practical field, and it is from this epoch that the first technical treatises date. Grünfeld's method was, in turn, elaborated by various authors, and there appeared successively the *Aerourethroscope* of *Antal*, the *Diaphanoscopes* of *Schütze* and of *Casper*, the *Panelectroscope* of *Leiter*, *Otis'* instrument, etc. Finally *Oberländer*, in his turn, made a complete modification of the instrument. Following successive improvements which he made, he

finally succeeded in constructing a perfect apparatus, and thus made an absolutely complete study of this important portion of urology.

Oberländer recognized the fact at the outstart that the urethroscopic tubes, which had been employed up to his time were of much too small a caliber. He showed that it was almost always possible to use tubes of a greater diameter, a fact which increased the surface to be examined and, consequently, made the examination much more complete.

Finally, following the example of Nitze, to whom belongs the original idea of this innovation, he introduced an electric source of light in the extremity of the tube, quite close to the region to be examined. He thus obtained a light much superior to all others and succeeded in studying the most minute anatomical details of the region.

[Undoubtedly the *Nitze-Oberländer* urethroscope created modern urethroscopy. Although previous observers have worked out detailed accounts of lesions, their diligent researches were necessarily limited. Oberländer was enabled, by the use of his instrument, to perceive details hitherto unseen, and to build up a system on an anatomo-pathological basis. To him is due the credit of elevating urethroscopy to the rank it merits as a legitimate, indispensable procedure for diagnosing and treating chronic, circumscribed lesions of the urethra. *Kollmann's* urethroscopic studies have won for this method scores of friends, and it is largely due to his untiring efforts that chronic gonorrheal urethritis in all its protean aspects is understood and cured. Urethroscopy gave him the impulse to invent his ingenious instruments for which the profession is so largely indebted to him.

The only drawback of the well-nigh perfect urethroscope of Nitze-Oberländer was the unprotected incandescent loop of platina which necessitated a cooling device.

This, of course, made the instrument somewhat cumbersome and expensive. Besides, when mopping the urethra with the cotton-carrier, the light had to be extinguished to prevent the cotton catching fire. The observer was apt to lose, by this maneuver, the particular point of the urethra he had in view previously. But these shortcomings did not detract much from the value of the instrument with those accustomed to work with it. The idea to introduce small incandescent lamps into the urethroscopic tube without cooling device was tried by Heynemann of Leipsic, according to a written statement from him. He states therein that *Dr. Loewenhardt* of Breslau had, a few years ago, invented such an instrument especially for the illumination of the posterior urethra. But it proved to be of no success, owing to the at that time unknown technique to produce mignon lamps. It was reserved for American ingenuity to perfect mignon lamps of such low tension, as to create a minimum of heat. Dr. Henry Koch of Rochester has caused such mignon incandescent lamps to be made, and such a urethroscope without water-cooling apparatus provided with a megaloscope was demonstrated by Dr. F. C. Valentine in 1899. Since then many improvements and modifications have been added, some of which we helped to devise. The fact is, that we now possess an urethroscope into which a mignon lamp is introduced instead of an unprotected platina loop, the source of illumination being derived from dry cells.

The lamp consumes an energy of $3\frac{1}{2}$ volts and 0.2 of an ampére. Therefore the energy consumed is less than 1 watt. The heat so generated is too low to be perceived, and is dispated by the adjoining metallic parts which consist of the socket for the lamp and the metal light-carrier. In a sense even the urethroscopic tube serves the purpose of dissipation. It takes ten minutes before the tube becomes perceptibly warm, and after fifteen minutes patients have not complained of an unpleasant sensation of heat. As

urethroscopic examinations are rarely conducted for such a length of time, it is self-evident that the question of overheating of the tube does not come into consideration.

Three dry cells furnish the light. A renewing, which is probably needed every six months, costs sixty cents. A rheostat governs the current and the intensity of the light. We have devised a small wheel on the horizontal part of

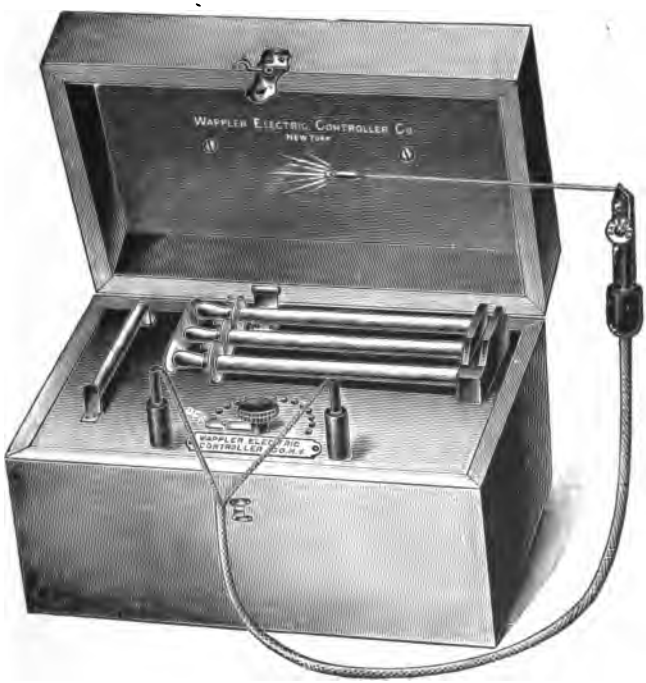


FIG. 8. CHETTWOOD'S URETHROSCOPE.

the light-carrier which is easily governed by the right thumb holding it. Likewise have we caused two upright bars to be made for a firmer hold of the light-carrier on the tube. For those that desire it a lens, fitted in a gavel which slides on a small metal rod fastened to the flange, is added. The whole apparatus, known as Chettwood's urethroscope, but slightly modified in form (Fig. 8), is

compactly put up in a handsome wooden box and can be carried about easily as an ever-ready and simplified appliance, which will gain to urethroscopy, it is hoped, numbers of devotees.

As to the question how to learn to practice urethroscopy, the answer is that it must be acquired through one already well versed in this particular kind of observation. The rudiments can very easily be grasped, but the explanation of what we see and the construction of the picture can only be attained by personal teaching. It is, however, by no means an impossible feat and need not deter any one from practicing it. The student who begins to use the ophtalmoscope is bewildered first, but soon learns to distinguish details. It is the same with the urethroscope.

Concerning the position of the patient, we prefer the semirecumbent one. In this half-sitting attitude the different parts of the urethra can be discerned with more ease for the operator and with less unpleasantness for the patient. The pendulous and bulbous urethra, even the pars membranacea, can thus be examined comfortably. Grünfeld himself prefers the patient in this position, so does Kollmann. Besides, it is worthy of some consideration that the patient should witness the procedure and feel safer in his expectations. The physician will have to content himself by conducting the examination standing.

One incident experienced by us and, as far as we know, not yet recorded, may be mentioned here. When sopping up the liquids, should the moist cotton-carrier, in its withdrawal, come in contact with the lamp, a fine vapor is generated, which forms a haze-like fog, through which the divergent rays of the electric light can be seen to irradiate, much like the rays of the lighted street-lamps when they pierce the fog. This phenomenon is perplexing for a short while, but is soon dissipated by the haze escaping through the tube. As cotton-carriers we prefer, instead of the handy but breakable long match-sticks, wire tampon car-

riers serrated at the visceral end and bent in a right angle at the handle, thus permitting an unobstructed view.]

Description of the Apparatus. — The endoscopic tubes employed by Oberländer are, as we have stated, of a larger diameter than those formerly in use. They correspond to numbers 23, 25, 27, 29, and 31 of the Charrière scale. Measurements made by Oberländer and Kollmann on three hundred patients, resulted in finding that two or three per cent only of the subjects presenting themselves for examination had a meatus too tight to admit a number 23, while in sixty to seventy per cent, number 27 could be readily used, and even number 29. In ten per cent it was necessary to use a number 23, and in twenty-five per cent a number 25. Only one of the patients

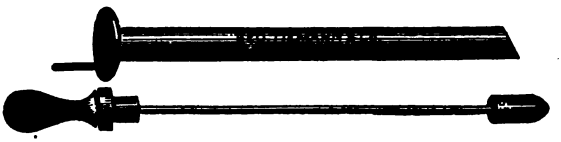


FIG. 9. OBERLAENDER'S URETHROSCOPIC TUBE.

had a meatus large enough to admit a number 31. Our personal observations are in accord with these figures.

Numbers 27 and 29 are those by far most frequently employed, and there is a decided advantage in making use of the largest tube possible. The surface to be examined becomes stretched to its greatest capacity, and the folds of the mucous membrane are effaced in such a way that small lesions which they might cover and hide are brought to light.

Urethroscopes (Fig. 9) are constructed of silver, with very thin walls. They are furnished with an obturator of conical extremity, which serves to facilitate their introduction into the urethra. This is to be gently withdrawn when the tube is in place.

For this reason the obturator is hollowed out with a lateral groove to allow the air to pass and prevent its

acting as a piston during withdrawal, and thus to forcibly draw the mucous membrane into the distal end of the tube. There are to be had obturators with a hinge (Fig. 10), giving to the urethroscope the form of a jointed or elbowed sound, which facilitates introduction into the posterior urethra; it is possible, then, by turning a screw

FIG. 10. OBERLAENDER'S JOINTED URETHROSCOPE.

to straighten the obturator and withdraw it from the tube when the latter is well in place. But this ingenious instrument is but rarely employed, because it is generally an easy matter to introduce a straight tube into the posterior urethra.

The ocular extremity of the tube bears a small projection, on which the light-carrier is fastened, as we shall presently see. The opposite extremity of the latter is slightly beveled, like the mouth-piece of a flute, and it is upon the prominent portion of this beak that the incandescent thread rests, so as to light up freely the surface of the mucous membrane.

Finally, Oberländer employes a dilating tube composed of two concave pieces put together in the form of a cylinder, when not in use, and which can be separated at will like the valves of a Cusco speculum, once the urethroscope is introduced to the point which is to be examined. It is possible, in this way, even when the meatus is very narrow, to stretch the mucous membrane out completely at the widest portions of the canal and study its minutest details. Before the instrument is withdrawn it should be closed. Since the margins of the two semi-cylinders do not fit exactly upon each other, no risk is run in pinching the membrane in closing the tube. This apparatus

does very well for a detailed study of the lesions of the mucous membrane; but in general practice the simple straight tubes are more convenient and are amply sufficient. To light up the surface of the canal, Oberländer employs the light from a thin thread of platinum heated to a white heat by the passage of an electric current. This thread rests upon a small hollow plane in which a stream of cold water constantly circulates, which is furnished by an irrigator placed at a convenient height. The illuminating apparatus is placed at the extremity of a rod or light-carrier, in such a manner that the thread of platinum comes quite close to the extremity of the endoscopic tube without, however, being able to reach the mucous membrane. Finally the extremity of the light-carrier is beveled so that the thread is not visible and the eye of the observer, not being inconvenienced by the glare of direct light, distinctly sees the endoscopic image. The light-carrier, as a whole, occupies so little space

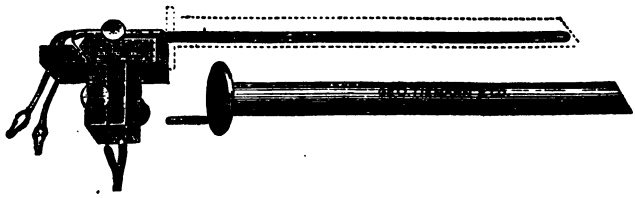


FIG. 11. OBERLAENDER'S LIGHT-CARRIER WITH COOLING ATTACHMENT AND TUBE.

that, when it is well applied to the wall of the instrument its presence is scarcely noticed. All of these details will be better understood by referring to Fig. 11.

[The insertion of the incandescent curved platinum thread into the light-carrier was a source of annoyance when an exchange was necessary. To avoid this, Kollmann has devised a modified fixation of the light, and Wossidlo a new adjustment of the platinum wire.]

Besides the endoscopic tubes and the light-carrier certain other accessory instruments are employed, such as cotton-carriers, thin rods on whose extremity a small wad of cotton is twisted. These are passed down the endoscopic tube to soak up any fluid to be found upon the

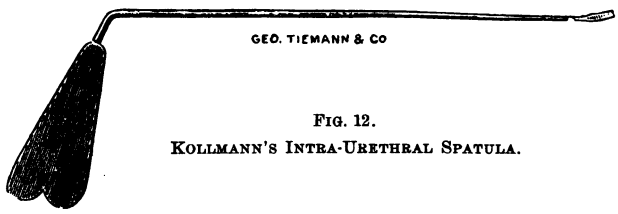


FIG. 12.
KOLLMANN'S INTRA-URETHRAL SPATULA.

mucous membrane of the urethra. Oberländer, Kollmann, and others have had constructed:

1. Small stylets, curettes, spatula (Fig. 12), capillary probes (Fig. 13) and aspirators (Fig. 14) to be introduced into the glands of Littre and to extract their contents.

2. Knives to make pricks or incisions into large foci of infiltration (Fig. 15).

3. Sounds insulated nearly to their extremity, which are intended to be introduced into glands which it is desired to destroy by electrolysis (Fig. 16).

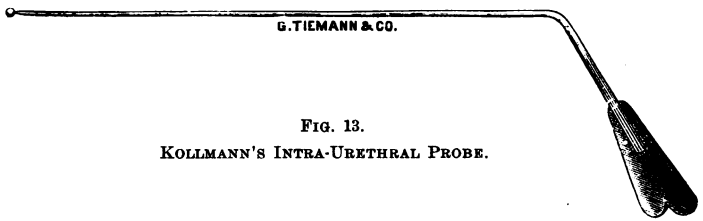


FIG. 13.
KOLLMANN'S INTRA-URETHRAL PROBE.

4. Instruments intended for intra-urethral galvanization (Fig. 17), and for injection into glands (Figs. 18 and 19).

These instruments may be employed, but are by no means indispensable and, indeed, they are but rarely used.

Finally, the necessary electric current may be furnished

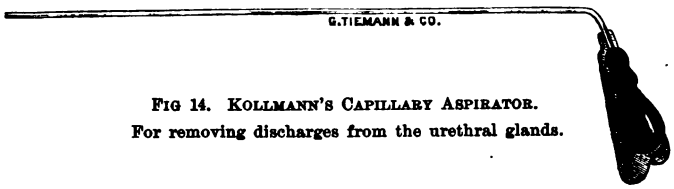


FIG 14. KOLLMANN'S CAPILLARY ASPIRATOR.
For removing discharges from the urethral glands.

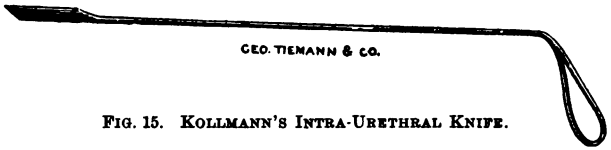


FIG. 15. KOLLMANN'S INTRA-URETHRAL KNIFE.

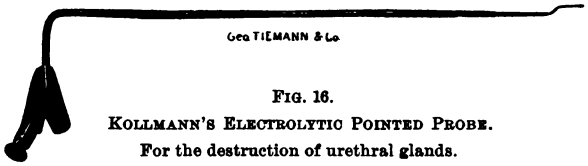


FIG. 16.
KOLLMANN'S ELECTROLYTIC POINTED PROBE.
For the destruction of urethral glands.

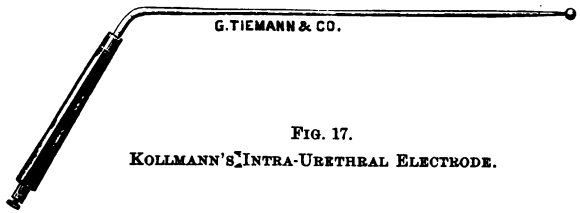
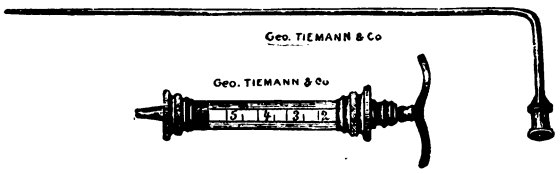


FIG. 17.
KOLLMANN'S INTRA-URETHRAL ELECTRODE.



FIGS. 18 AND 19. KOLLMANN'S CANNULA AND SYRINGE.
For injections into the urethral glands.

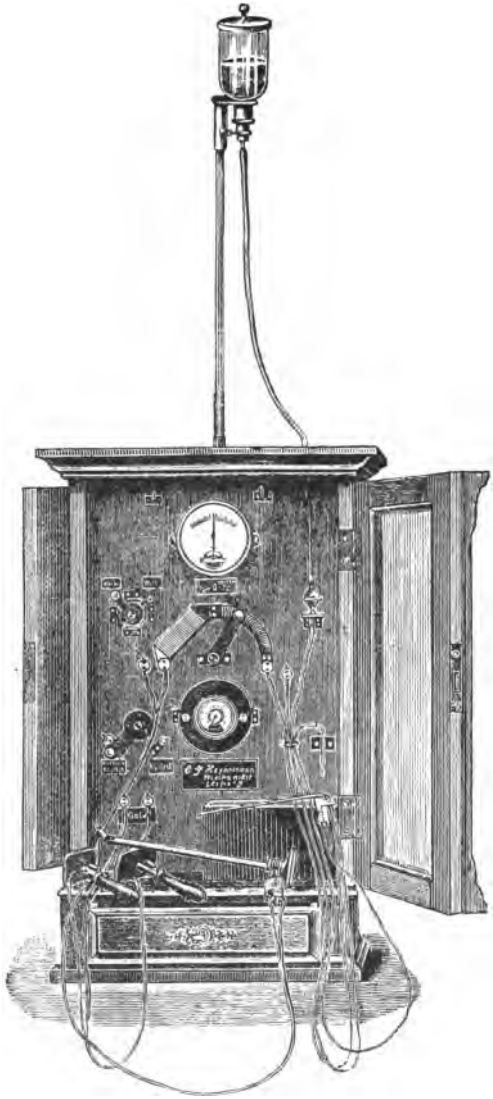


FIG. 20. KOLLMANN'S COMPLETE APPARATUS.
For electro-uroscopy, cystoscopy, electrolysis and galvanization.

by accumulatory or by bichromate of potassium batteries; a convenient rheostat permits the current to be regulated at will.

[Figure 20 shows a complete electro-urethroscopic outfit containing appliances for urethro- and cystoscopy, electrolysis, and galvanization. The instruments are furnished by Heynemann, instrument maker in Leipsic.]

[Fig. 21 represents Otis' improved urethroscope. Here the light is projected into the tubus by means of an electric lamp condensed by a lens, and a funnel-shaped diaphragm

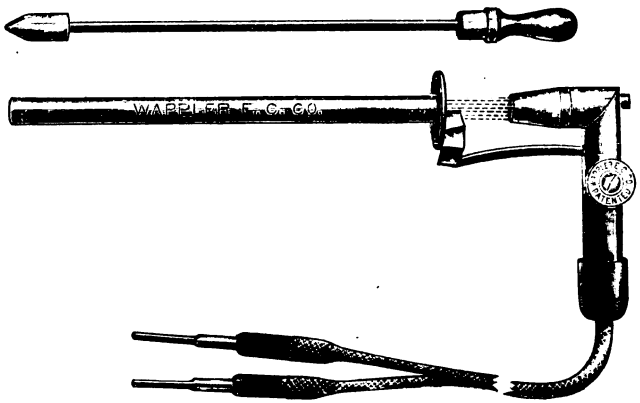


FIG. 21. IMPROVED OTIS URETHROSCOPE.

to cut of extraneous light. This whole light-source is properly adjusted to the tube by an immovable arm, which secures a proper centering of the light rays at the other extremity of the tube.

This ingenious instrument is no doubt the best of urethroscopes having the light outside the tube, and is worthy of a place in one's instrumentarium. We prefer the direct light introduced into the tubus.]

Operative Technique.— This is how we proceed to make a urethroscopic examination: First of all, we must be sure the instrument works well. The platinum wire is

fastened at the extremity of the light-carrier in such a way as to be removed and replaced readily. We must, therefore, examine to see if it is fixed in place. The stop-cock which regulates the current of water is opened, and we make sure that the flow is established. The electric current is now turned on, and the rheostat is manipulated until a suitable light is secured. Being thus assured that all is in working order, the current is interrupted. If by chance a too strong electric current has burned out the wire, it will be necessary to employ small forceps to bring together the two extremities and, by causing a weak current to pass, they may be effectually welded together again. Finally, if it has been neglected to establish the stream of water before the wire loop was brought into an incandescent state, the light-carrier will become overheated. In this case, we must be cautious about too suddenly opening the stop-cock, which might result in a diminutive explosion and destruction of the apparatus when the water came into contact with the heated plates. But we must first let the instrument cool off before repairing the result of this negligence. It is a good plan when we go to examine a patient, especially if he is not already familiar with the procedure of catheterization, to anesthetize the urethra by means of cocaine. We employ for this purpose a three per cent solution, which we introduce into the urethra by means of an ordinary injection syringe three-quarters full. Oberländer uses, at the present time, instead of cocaine, a three per cent solution of eucaine. This anesthetic seems to have the same properties as cocaine without possessing its dangers. In several thousand examinations, we have never seen any serious phenomena of intoxication following the injection of cocaine. At most, some few patients have complained of slight malaise after the injection. The fluid is retained in the urethra for five minutes and, by means of slight pressure by the finger along the course of the canal, it may be distributed therein.

It is to be noted, however, that the effect of the cocaine slightly modifies the image as seen through the urethroscope. The passage of the fluid and the frictions along the canal may indeed cause slight superficial changes in the epithelium to disappear and carry away, especially, the the scales which cover the foci of dry infiltration. On the other hand, the cocaine produces a contraction of the small capillary vessels, so that after the injection the mucous membrane appears paler than it in reality is. [To avoid these inconveniences, we should use a local anesthetic as rarely as possible, and only when great hyperesthesia demands it. As a routine, we perform urethroscopy without it, to our and the patient's mutual satisfaction.]

Anesthesia being thus obtained, the urethroscope tube is introduced. The first examination should always be made with a number 23. If the meatus is too small to admit it, a condition much more rare than one would be led to believe, we must either enlarge it a little or give up the examination, because tubes of a smaller diameter give a too restricted field of vision; but if the meatus is wider, we must nevertheless begin with a number 23; the larger tubes scrape the mucous membrane, destroy interesting epithelial lesions, or provoke, at narrow points, slight hemorrhages which make the examination difficult, and necessitate its being put off to another time. If the meatus permits of it, we may complete the examination later by the use of a tube of larger dimensions.

To be introduced into the urethra, the tube should first be well covered with glycerin. When the meatus is very tight, we may also apply a little oil or a small quantity of vaselin to facilitate the passage, but fatty lubricants should be avoided as much as possible because they coat over the surface of the mucous membrane and render it too glistening, while glycerin may be easily removed by means of a small cotton-carrier.

The urethroscope is grasped in the right hand, while

the left hand presses back the prepuce and gently opens the meatus. Once this is passed, as well as the bottom of the fossa navicularis, which may likewise be quite narrow, it is generally an easy matter to push the urethroscope as far as the bulbar *cul-de-sac*. If abnormal resistance is met with, due to strictures, the penis may be gently pulled upon with the left hand, while the tube is slowly pressed in; but violence must be avoided, since hemorrhages are caused which render the examination impossible. Once having reached the bulbar *cul-de-sac*, the obturator is withdrawn, then with the aid of a cotton-carrier the fluids which might be present in the depths of the canal are mopped off. The light-carrier is then introduced and fastened by means of a screw upon a projection which is on the flare of the urethroscope (Fig. 9) and the current is turned on. It is now possible to examine the urethra in its whole length by slowly drawing out the tube; we must, however, sop up from time to time, by means of a cotton-holder, the fluids which would otherwise make the walls of the canal too moist. Each time it becomes necessary to carry out this manipulation, the light-carrier should be first withdrawn. This is an annoyance and one of the inconveniences of the Oberländer method. Once accustomed, however, the manipulation is done without trouble. [This inconvenience has ceased to exist since the introduction of the new mignon-lamp, where mopping under light can be carried out.]

To make a good examination, we must, first of all, have a light above reproach. The platinum wire must be fully incandescent; if it is simply red, the light is insufficient; if it is too white, it dazzles the sight. We have said that the extremity of the light-carrier is cut beveled so that the platinum wire lies on the surface inclined toward the bottom of the canal, and can not be seen by the examiner. If it were not closely applied to this plane, the light would not be hidden and would confuse the operator; if it were

applied too forcibly against the cylinder the contact of the latter might diminish the power of the light; one should also always be able to pass a sheet of paper or a thin blade of a knife between the wire and the plane upon which it rests. The urethroscope should, during the whole examination, be kept in the axis of the canal so that all sides are equally visible. When it is desired to specially examine a point upon one or the other wall, the instrument can be held obliquely so as to apply its extremity to the point to be studied.

To examine the posterior urethra, Oberländer recommends the use of the jointed obturator with hinge-arrangement, of which we have spoken. It is, perhaps, as easy to use the ordinary obturator. The point of the urethroscope is slowly engaged in the membranous and prostatic urethra in lowering gradually the flare or handle of the instrument, according to the ordinary rules of catheterization with straight instruments. The greatest gentleness must be employed, because the posterior urethra bleeds readily, and it is not always possible to avoid this inconvenience. The instrument being introduced up to the neck of the bladder, we proceed as in examination of the anterior urethra. The most interesting wall is here the inferior, in which the verumontanum is situated.

[It is a source of great satisfaction to urethroscopists, and quite a vivid evidence of the interest manifested recently in endoscopy of the urethra, to see the efforts for improvement follow each other in rapid succession. The Nitze-Oberländer model serves as yet as a basis for all other modifications of such urethroscopes which contain the light within the extremity of the tubus. But since the replacing of the uncovered incandescent platinum wire of the Nitze-Oberländer apparatus by the almost heatless light of a low-tension mignon lamp of American invention (Koch-Preston, of Rochester), and the consequent discarding of the cumbersome cooling device, the possibilities

of urethroscopy have taken on rapid strides. The unprotected lamp, the encapsulated lamp, Koch's tubus having the light-carrier and lamp held in a small separate tube under the larger endoscopic tube proper, are all evolutions of the same principle toward perfection. It occurred to us, however, that one of the most salient principles of the Nitze-Oberländer light-carrier has been lost sight of in the construction of lamp-carriers. Oberländer has repeatedly pointed out the necessity of the light-source being invisible to the eye, as its presence in the visual line would confuse the observer. Therefore his incandescent platinum wire lies on an inclined plane toward the bottom of the tubus. We have caused this principle to be applied to our modern mignon lamps, and found, to our regret, that at present such small lamps cannot be made with the desired angle, although we are trying to have such lamps produced. Therefore we had to give to the extremity of the lamp-carrier such an inclined form as is shown in Fig. 22 *A* and *B*. The external part of it, which serves as a handle, carries a knob (Fig. 22 *B*, *k*) on its lower portion which fits into a perforation (Fig. 22 *A*, *p*) on the disk of the tubus, and a small pin (Fig. 22 *B*, *p'*), which fits into a slit (Fig. 22 *A*, *s*) on the outer circumference of this perforation. This arrangement secures a handy and firm interlocking between disk and lamp-carrier, serving as an immovable, firm handle (Fig. 22 *A*, *h*). Thus the jerking which was caused in trying to get the pin or pins on the disk of the tubus enter through the corresponding holes on the handle of the light-carrier is obviated. When the shaft of the light-carrier is screwed into the handle part, an insulated spring (Fig. 22 *B*, *sp*) makes automatic contact with an insulated wire within the shaft, while the light-carrier itself acts as a conductor for the lamp-connection. The lamp rests on an in clined plane of such an obtuse angle as to be invisible to the eye, and yet not to encroach upon the lumen of the tubus.

The *tubus* has an *oxidized* disk, 1¼ inches in diameter, preventing reflection of daylight or other extraneous light into the eye. The disk is provided with a perforation (Fig. 22 *A*, *p*), as mentioned above, for the reception of the knob, and a slit (Fig. 22 *A*, *s*) on the outer margin of this perforation to receive the pin of the lamp-carrier in order to insure a firm interlocking and to act as a joint handle. The visceral end of the tubus is burnished to

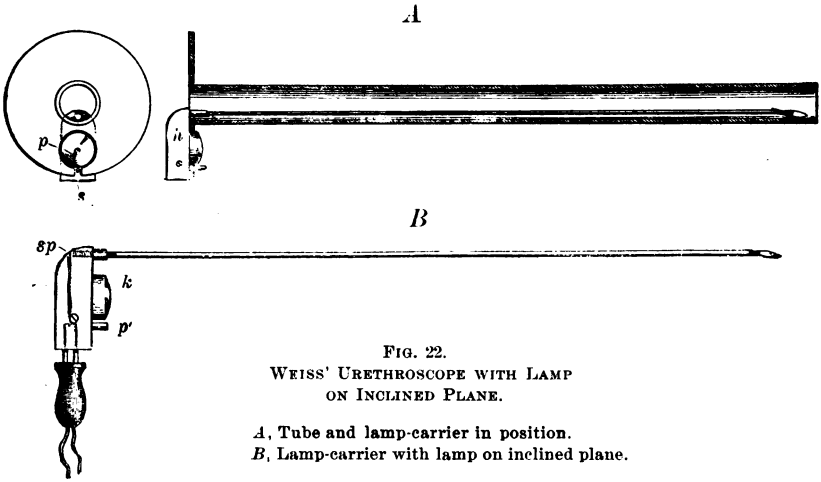


FIG. 22.
WEISS' URETHROSCOPE WITH LAMP ON INCLINED PLANE.

A, Tube and lamp-carrier in position.
B, Lamp-carrier with lamp on inclined plane.

permit of forward and backward movement without again inserting the obturator. The stem of the obturator carries no groove, is a trifle smaller than the bore of the tubus lumen, and is somewhat conically elongated, thus making withdrawal easier and without jerking, and preventing suction, as it is not fitted perfectly air-tight, and air enters the moment the obturator is withdrawn.]

We will now go over in a detailed manner the appearances of the normal mucous membrane, and the alterations it presents in chronic blennorrhagia.

II. ENDOSCOPY OF THE NORMAL URETHRA.—The appearances of the normal mucous membrane vary enor-

mously in different subjects, and still its characters correspond quite closely to the structure of the penis. If the latter is small and poorly developed, the mucous membrane will be thin and delicate, even in robust and well-formed individuals; it will be particularly vulnerable in individuals whose glans penis, as is at times seen, is in a measure atrophied, or when adhesions bind it to the prepuce.

During the endoscopic examination one is at once struck by the *color* of the membrane which naturally depends upon the *vascularization*. According as we have an anemic membrane, or as the vascularization is more or less abundant, the color is rosy, reddish, or bright red. Under the effect of cocaine it becomes slightly paler. It may also become markedly pale in consequence of pressure exerted by the endoscopic tube against the urethral walls, especially when it is too large for the canal, or when, being badly guided in the axis of the urethra, it presses forcibly upon one of the walls. It is always an easy matter to make out whether these modifications are brought about by the examination itself, and one should guard against confounding them with analogous changes due to the presence of lesions of the mucous membrane.

The vascularization and, therefore, the color of the canal not alone differ in different subjects, but present great variations in the same individual, according as we examine regions more or less deep. At the region of the glans, for example, the membrane is lacking in papillæ and is poor in vessels; thus it has a smooth appearance and seems much more pale than does any other portion of the canal. The aspect changes as soon as we reach the coronary sulcus. At this point, also, the *longitudinal folds* begin which reach to the *cul-de-sac* of the bulb. This folding, analogous to that encountered in the esophagus and in certain portions of the intestines, is due to the fact that the mucous membrane which follows the marked extension of the penis at the time of urination and especially of ejacula-

tion, puckers up in the state of repose, forming folds whose number is, of necessity, in accord with the natural dimensions of the urethra and the structure of the penis. The canal presents, besides, transverse folds which permit of its elongation or abbreviation in following the variations as to the length of the penis. But when we proceed to the urethroscopic examination, by the slow withdrawal of the tube these folds are obliterated, by reason of the traction exerted, and are no longer distinguishable.

All these details, however, are made out only upon an attentive examination, and the beginner who is experimenting with endoscopy for the first time sees only a mucous surface more or less red. In examining the image more closely, he soon perceives that this mucous surface forms a sort of funnel, presenting at its central part an orifice which is called the *central figure* (*Centralfigur*). This changes in aspect in the different regions of the urethra; in the region of the glans it has the form of a small vertical slit, slightly rounding off in an oval shape; in the penile region it is punctiform, enlarging at times a little, so as to form a transverse opening; in the region of the bulb, and as we advance from this point toward the posterior urethra, the inferior wall of the funnel becomes more and more prominent according to the position of the endoscopic tube. The infundibuliform appearance given by the endoscopic figure results from the anatomical disposition of the canal whose walls are, in the flaccid state, approximated so as to completely obliterate the lumen. At the moment the endoscope is passed, its walls spread out symmetrically at the extremity of the instrument and thus form, by the gaping, the appearance which we have described. It results naturally from this that the longitudinal folds of the mucous membrane now appear in the form of spokes of a wheel, and are best marked at the central figure where the canal is still closed; they spread out, on the contrary, according as we approach the borders of the instrument;

they will be the more effaced the greater the caliber of the tube which will tend to spread them out the more completely. The larger the urethroscope and the smaller the canal, the less marked will be the folds; their number varies from two to ten on an average. They should be studied carefully in healthy subjects, because chronic changes in the canal are accompanied by altered appearances which one must learn to recognize.

The end of the urethroscopic tube being slightly cut like the mouth-piece of a flute at the expense of its upper portion (Fig. 9), it results that the corresponding wall of the urethra will be the most spread out. This mucous membrane well stretched is, especially in the penile region, traversed by reddish *longitudinal striæ*, of more or less bright color, and standing out well upon a background of epithelium, which is paler. This striation is always to be found in a normal mucous membrane; it is best marked in a very vascular membrane, and disappears in certain pathological states, as we shall see further on. Furthermore, the surface of the urethra is also traversed by *vascular ramifications* which, while not very numerous in anemic subjects, are, on the other hand, well developed in vigorous subjects. In the latter, at any rate, all the characteristics which we have just gone over are equally well marked; the longitudinal folds are numerous and quite visible, the longitudinal striation is quite apparent, the radiations are of a beautiful and brilliant red, standing out well against a groundwork of mucous membrane which is rose-color, tinged slightly with yellow.

Finally, the surface of the urethra is smooth and shiny, in its entire extent. We shall see later on that the slightest pathological changes modify this aspect; the mucous membrane becomes then irregular and loses this polish and brilliancy which are quite characteristic. The orifices of the *lacunæ Morgagni* are visible in the entire penile and bulbar regions. In a very wide canal, where the surface

forms numerous folds, these orifices may pass unperceived at a first examination, especially when one is not thoroughly familiar with the use of the endoscope. They are distinguished, however, by the fact that they appear in the form of small points slightly excavated or dimpled, of the same color as the neighboring surface, or presenting a slightly rosy appearance; at other times they are better marked, and we can clearly see small orifices analogous to pricks made with a needle, slightly gaping. In their normal state the borders can scarcely be said to be raised above the surrounding surface; from the moment they become really prominent, or surrounded by a red zone, pathological modifications come into question, about which we shall subsequently speak. In the normal state, too, we do not perceive the small glandular groups which are found in pathological conditions. Littre's glands are almost absolutely invisible in a canal that has never been diseased. Under the influence of gonorrhea, modifications occur in them which permit of their being clearly perceived. Once these lesions are formed, some change always remains behind, and the glands remain visible even after complete cure.

To resume: The normal mucous membrane appears in the region of the glans as a smooth surface; from this point to the *cul-de-sac* of the bulb it presents, on the contrary, longitudinal folds the more marked the stronger, in its general construction, is the penis itself. These folds are quite visible with the urethroscope at the point which has been named the central figure, and the neighboring parts of the infundibulum. At points where the mucous membrane is well spread, the more or less characteristic striation can be made out, and the orifices of the Morgagni lacunes sought for.

The color of the mucous membrane is not always uniform; it varies in different plaques from grayish red to blood-red, according to the degree of vascularization. The

surface is uniformly smooth and shiny. The passage from the bulbar to the membranous region, at the external vesical sphincter, is always formed by the heaping up of mucous folds which are pressed one against the other. We shall see, further on, the urethroscopic appearances of the posterior urethra.

Such is the usual aspect of the urethral mucous membrane in its normal state, but all its features are more pronounced in a vigorous and full-blooded individual, with a well-developed penis; they are, on the contrary, attenuated in weak, anemic individuals, and in those having a small organ. In the latter we observe, at times, an altogether particular and indeed quite rare form: the mucous membrane seems thickened and pale; neither folds nor longitudinal striations are encountered. This appearance would suggest a lesion were it not uniform through the whole extent of the urethra, a condition which never arises from pathological change; besides, the normal appearance of the glandular orifices and the very smooth and shiny surface of the epithelium would suffice to throw out this supposition.

All the normal characteristics of the mucous membrane are profoundly modified in the pathologic state.

We shall study successively the lesions of the various elements which constitute the canal, lesions which undergo ceaseless modifications from the moment a chronic urethritis begins, up to the time it attains its greatest development; these lesions diminish as improvement goes on, and disappear with the establishment of a cure. This process of cure may be followed, step by step, during the whole treatment, and is thus easily described.

As to the evolution of the morbid process, it has evidently not been followed in the same manner, and we must content ourselves by describing it as it may be logically deduced from a study of different cases at the time they present themselves for treatment.

III. ENDOSCOPY OF THE PATHOLOGIC URETHRA—GENERAL SURVEY.—We have seen, in a preceding chapter, that Neelsen considers, as the chief lesion of gonorrhoic urethritis, the infiltration which forms in the acute stage and becomes organized in the chronic period; it is to this chief lesion that all others which follow are attributed. Oberländer, in his urethroscopic studies, starts from the same point and follows an analogous course. Thus he logically draws for us a complete picture of this affection, whose study we will begin, and successively go over all the details. The division of the various forms of chronic urethritis is made according to the more or less advanced degree of organization which the new-formed infiltration tissue has attained. Oberländer describes two chief classes. In the first class are placed all urethrites characterized by a "soft infiltration"—an infiltration which has remained in the embryonic state without any formation of connective-tissue fibers. The second includes the "hard infiltrations," where transformation into fibrous tissue has taken place; the latter is subdivided, in turn, according to the degree of density of the new-formed tissue and the resulting diminution in caliber of the urethra. In reality there are no different forms of gonorrhoic urethritis which correspond precisely to all these divisions, but rather there are successive phases of the same affection. In these different periods the aspect of the diseased regions is indeed modified at the same time that the infiltration of the mucous membrane is taking place.

Soft Infiltration.—Properly speaking, this form, which is characterized by the presence, within the substance of the mucous membrane, of an embryonic infiltration deprived of all fibrous element, *does not belong to chronic urethritis*, but in reality to acute urethritis. However we see, at the borders of regions invaded by an older lesion, the constant existence of a zone where the changes are recent and still correspond to the stage of soft infiltration.

The appearances it presents does not differ at all from those of catarrh of any mucous membrane. The surface is hyperemic, inflamed, and turgescent, the epithelial layer is swollen and slightly desquamating.

According as the parvicellular infiltration becomes more dense, it becomes localized by preference about the glandular masses; the cylindrical epithelium is transformed into pavement epithelium.

If the evolution continues, connective-tissue fibres appear in the midst of the parvicellular infiltration, and we pass on to the second of Oberländer's classes, that of hard induration. This evolution of the lesion takes place, at times, with such a degree of rapidity that the succession of the different stages escapes observation, and we find ourselves at once in the presence of hard infiltration without having recognized the stage of soft infiltration.

Hard Infiltration.—Once we have arrived thus at the second stage, the infiltration is invaded more and more by connective tissue, and this fibrous transformation goes on constantly, carrying surely with it parallel changes in all the elements which go to make up the wall of the urethra. The glands are attacked and soon play an all-important rôle, upon which we should dwell for a moment. Two things may happen: Either the excretory duct becomes obstructed by compression of the neighboring tissues or by retraction of its own walls, the products of secretion are then retained and accumulate in the gland which has been thus transformed into a sort of small cyst; or, on the contrary, the excretory duct of the glands remains permeable.

Oberländer based his description of the two forms of urethritis upon this criterium. Obstruction and encystment of the glands characterize the first variety: dry or follicular form. The second variety is the glandular form. The dry form is observed in about fifty per cent of cases. At times there exist, at the same time, cystic zones and zones

in which the inflamed glands open into the canal; these urethrites constitute the "mixed forms." It is extremely rare that the mixed form appears at the onset before any treatment had been instituted. The glandular form is almost as frequent as the dry form.

The urethrites of the dry form do not deserve this name excepting from the appearances presented by the mucous membrane deprived of glands; but they are not entirely without suppuration, and are almost always distinguished, on the contrary, by an obstinate discharge. It is the very presence of these little cysts in the midst of the mucous membrane which impedes the circulation of the blood, and thus provokes various changes of nutrition, especially in the epithelial coating, thus making the process of cure a very slow one. When we treat these urethrites by dilatation the cysts open, become atrophic, or are destroyed; the excretory ducts of the glands becoming free, open outwardly, and we pass, little by little, to the mixed form; then to the glandular form. The treatment is always quite long, and can not fail to put to a severe test the patience of the physician as well as that of the patient. We have seen that chronic urethritis, properly speaking, begins at the moment connective-tissue fibers appear in the soft infiltration, and preferably about the glands. The process then follows a course extending over a more or less definite time without our being able to arrest it. All internal treatment, all injections and, even up to a certain point, all mechanical treatment prove powerless. We are in entire ignorance why this process begins. Once the lesion is formed, we know the treatment it calls for.

At the beginning of the transformation of soft into hard infiltration, the appearance of connective-tissue fibers might pass unperceived in a urethroscopic examination, because of the turgescence of the mucous membrane. But by means of a few dilatations, the true nature of the process is made evident. According as the process evolves,

the hard infiltration spreads more and more; it will be the more dense and the more compact according as the soft infiltration, to which it succeeds, has been dense and compact. This greater or lesser degree of density, which one can very clearly appreciate by the urethroscope, gives the degree of gravity of the case.

According as this is more or less pronounced, we see the caliber of the urethra modified. If the infiltration tissue is not very compact the canal will preserve its normal caliber; this is what Oberländer calls the first degree. If the density is greater, this caliber will diminish; as long as endoscope number 23 (15 Amer.) will pass, the infiltration belongs to Oberländer's second degree; and as soon as the stricture increases to such a point that the tube will no longer pass, we arrive at the third degree.

This division is evidently quite arbitrary, but we believe it wise to keep to it, in the absence of a better one, and for the further reason that it is very important from the standpoint of prognosis and treatment. The other divisions adopted by authors are not more rational. The first degree and the lighter forms of the second degree correspond to the wide strictures described by Otis. The forms generally known under the name of strictures corresponding to the third degree of Oberländer, as well as all infiltrations in reality hard, are necessarily accompanied by a diminution in the extensibility of the walls of the canal or, in other words, form a stricture. When we come to the most pronounced degrees, the infiltration tissue forms a sort of cuirasse surrounding the canal, and this we can very readily make out in palpating the latter, especially during dilatation, when the walls are stretched by the instrument. This is a convenient and practical means of gaining information as to the extent and thickness and, consequently, as to the gravity of the case.

As we have said at the beginning of this chapter, the infiltration is the primary lesion from which spring all the modi-

fications observed in the morphological elements of the urethra (epithelium, glands, etc.), as well as in the functions and appearances of the canal. We must now study separately each one of the elements in the normal and in the pathological state, and we will finish with a succinct study of the chief morbid types described by Oberländer.

Description of the lesions observed in the tissues:

I. The mucous membrane with its vascularization, its color, its striation.
II. Epithelium.
III. The caliber of the canal with the central figure, and the fold which its walls form each time its caliber varies.
IV. The glands of Littre and the lacunæ of Morgagni.
V. The infiltration itself with its complete evolution from the commencement of its fibrous transformation to the end-stage of cicatricial regression which marks the termination of the process.

Description of the pathological forms:

a. Soft infiltration.
b. Hard infiltration.
I. First degree. { Glandular form. / Dry form.
II. Second degree. { Glandular form. / Dry form.
III. Third degree. Strictures.

The description which will follow includes all the typical forms of the lesions characteristic of the different tissues which constitute the urethra. But we must observe that we may find in the same canal, side by side, lesions belonging to different types. In other terms, alongside of lesions of urethritis belonging to the third degree we will find others belonging to the second and to

the first degree and even lesions of soft infiltration. We will also find mixed forms, for the classical forms which we describe are never met with in the pure state unless the canal has not yet been subjected to any mechanical treatment. Once it has been subjected to such treatment anatomical changes are produced which change the purity of the pathological type, and give rise to mixed forms and to transition forms intermediate between the types which we are describing.

DESCRIPTION OF THE LESIONS MET WITH IN THE TISSUES OF THE CANAL.—We have seen that chronic urethritis does not uniformly invade the whole extent of the canal; it *becomes localized, on the contrary, in irregularly disseminated foci* which are encountered chiefly in the middle portion, or quite anteriorly in the penile portion. Contrary to the opinion generally accepted, the lesions are more rare in the region of the bulb. In this respect examinations with the urethroscope can leave no doubt. It often happens, however, that different regions of the urethra are attacked at the same time. The diseased areas have very variable dimensions, their form is irregular, their borders are not clearly defined and are, little by little, passing over into the healthy surrounding tissues. Almost always the lesions are more marked and older in the center of the area than at the circumference, where the process seems more recent and appears to have a tendency to invade, in a progressive manner, the neighboring parts. Besides, these foci are frequently cut into by zones of tissue which have remained healthy.

We shall now study successively the various anatomical elements.

I. *The Mucous Membrane.*—Change of color is the first modification observed in the tissues of the mucous membrane at the beginning of infiltration; during the *period of soft infiltration* the mucous membrane is hyperemic and consequently redder than in the regions which have re

mained healthy. This color will naturally vary from deep rose to blood-red and even to a cyanotic red according as the normal mucous membrane is, as we have seen, pale rose, reddish, or scarlet red,

On the contrary, the *hard infiltration* is characterized by diminution of intensity of this color. The phenomenon is due to the presence of fibrous tissue which strangulates the vessels and impedes the circulation. The peripheral portions of the area, in which the lesion is less advanced, will preserve the characters of mucous catarrh and will be more decidedly colored. It is so, at least, in cases which have not yet been subjected to dilatation and in which the characters have not yet disappeared about the zones which are the least affected.

The pallor of the zones invaded by fibrous infiltration, quite marked already in the glandular forms, becomes altogether characteristic in the dry forms. Here the mucous membrane takes on a characteristic color, uniformly yellowish gray, resembling, in a measure, an eschar. This aspect of dead flesh disappears very slowly under treatment as the progress of cure goes on. At the same time that the mucous membrane, in the two forms of fibrous infiltration, takes on a uniform pale color, the longitudinal striation which the surface normally presents, disappears in a more or less complete manner. In the dry form, it remains, at times, still visible but less distinctly outlined than in the normal state; it reappears slowly with the normal color as cure takes place.

To sum up, the mucous membrane, which is the seat of *infiltration in the first degree*, is characterized by a change of color and a dull appearance quite different from the brilliant luster of the normal membrane. The diseased areas are raised a little above the surrounding healthy surfaces, from which they are separated by irregularly marked limits; at the borders of the patch the pathological process is less advanced than in the center.

Cicatricial tissue is also present at times, but this belongs rather to the stage of regression, although we may find it when the lesion is still in full evolution. This cicatricial tissue is met with:

1. Surrounding the glands.
2. In the tissue of the mucous membrane itself.

The latter case is very rare in the light forms; we have here to do with small cicatricial meshes stretching out over a surface of five to fifteen millimeters, or with star-shaped cicatrices of from one to two millimeters. In the dry form these cicatrices become visible only after the cure. We have here to deal with an exceptional lesion. On the contrary we see that the formation of cicatrices in the midst of the mucosa is the rule in those forms of infiltrations which belong to the more advanced degrees.

In the *infiltration of the second degree* the symptoms are still more manifest. The mucous membrane is pale, and this pallor shows up best in the urethra, whose normal color is a bright red, while in anemic urethræ the difference in color is scarcely appreciable. Around the pale zones appear red spots corresponding to foci of mucous catarrh with soft infiltration. These spots are only found in the glandular forms; the dry forms have, on the contrary, a uniformly gray or reddish yellow color. The longitudinal striation, which has disappeared in the center of the spots, still persists upon the borders of the latter and at the points where the infiltration is the least marked.

Finally, in the center of the diseased area, at times, we find small *granulations* united in groups of one or two centimeters in extent, and most frequently situated on the inferior wall of the urethra. Their surface of gray or reddish yellow color, as though larded, is irregular and rugose; it tears and bleeds readily, especially when a somewhat large urethroscope is used. No glands are formed; these areas are, besides, of slight extent and altogether superficial. In the course of their evolution

they are invaded by a more or less thick connective-tissue hyperplasia. They are only met with in the glandular form; it is the same in the foci of cicatricial tissue which is lacking in the dry form.

In the glandular form the appearance of the cicatrices depends on the thickness and extent of the infiltration tissue from which they spring. The superficial infiltrations produce small reticulated cicatrices, of brilliant aspect, covered over with small vascular arborizations. In their reticulation are found healthy glands and lacunear depression. When the infiltration is deeper, on the other hand, thicker cicatricial masses are formed which at times fall into the opening of the urethroscope.

In the third case, *firm infiltration of the third degree*, we can not proceed to the urethroscopic examination until there has been a preceding dilatation of the canal. The lesions are also less clearly marked. The whole diseased zone is uniformly pale; the longitudinal striæ have disappeared, and reappear, little by little, upon the borders of the diseased areas, according as the cure progresses. At the same time the normal color reappears. The cicatrices, however, preserve their pearly white aspect. When the stricture is due to an infiltration belonging to the glandular form, the coloration is not at all the same, as if the infiltration would belong to the dry form. In the latter case the narrowed region is uniformly pale, grayish, and has a dead appearance. In the case of the glandular form, on the contrary, the color is irregular, scattered over with red plaques, and made to resemble the mucous covering of cartilage. The normal red color comes back, little by little, as the cure is effected, but the membrane, even after a very long course of treatment, never again takes on an entirely normal aspect. The cicatrices found in the midst of the tissue of the mucous membrane during treatment, are distinguished by their extent, their number, their reticulate aspect; they at times occupy a large part of the

caliber of the canal. Along with the progress of cure, the color which was at first reddish, pales out little by little, the vascular arborizations disappear, and the cicatrices finally take on a fibrous and pearly appearance; they lose their reticulate aspect and become smooth.

Finally, we may also find in certain cases long and deep cicatricial ridges, parallel to the long axis of the canal, or else twisting about in spiral course, and which are due to a sort of spontaneous scarring, developing in the infiltration of the mucous membrane.

II. *Epithelium.*—In the healthy state, the epithelial coating of the mucous membrane forms a smooth, moist, and transparent layer of uniformly brilliant appearance. It possesses a luster peculiar to itself which may still be increased by fluids, mucus, glycerin, etc., with which the surface is anointed when we make a urethroscopic examination. If, however, we use too strong a light, or if the wall of the tube be freshly polished, this glitter will be proportionately increased, and we might think some pathological process was in question. This is an error which must be avoided.

Pathologically, the epithelium becomes more brilliant when the most superficial regions of the mucous membrane are the seat of a mucous catarrh with hyperemia and embryonal infiltration. At times this feature is marked in the whole extent of the anterior urethra; at other times, on the contrary, it is seen only in a few foci about the glands or Morgagni's lacunes.

But most frequently, the lesions of the mucous membrane cause nutritive changes of the epithelium, which results in causing it to lose its transparence and glitter and to give to it a dull and irregular aspect, to provoke desquamation and even complete destruction.

In mild instances we find only few modifications; the diseased surface takes on simply a dull aspect, but it remains smooth, or at least the irregularities which it may

present are too faintly marked to become very distinct. If an anemic mucous membrane is in question, these slight nutritive modifications of the epithelium will even pass quite unnoticed. Its color then remains normal, but we may often recognize between the folds of the mucous membrane small hypertrophic capillary net-works which appear like elevations, perfectly appreciable on urethroscopic examination.

Finally, when these lesions of the superficial layers of the mucous membrane are of long standing, the epithelium is thrown off and the papillary layer, now laid bare, proliferates in giving rise to small *granulations* analogous to those encountered upon the surface of cutaneous wounds, but much less developed than the latter. They appear in the form of small reddish blotches, irregularly outlined and with a finely granular surface which bleeds readily.

All these lesions disappear after death, and are no longer recognizable upon the cadaver.

In the more severe forms, when the mucous membrane is invaded by a dense infiltration which is transformed into fibrous tissue, the tissues become choked and the circulation is impeded. Furthermore, the nutritive disturbances of the epithelium are much more pronounced. We may distinguish different degrees:

1. The epithelial surface has entirely lost its transparency. It takes on a roughened look due to desquamation and to irregular regeneration of the cellular layers. If we apply the extremity of the urethroscope directly against the urethral wall, we distinctly recognize a mass of small, irregular elevations, quite superficial, and which do not give rise to hemorrhage by reason of the examination.

2. In a more pronounced degree the preceding lesion is accompanied by an epithelial proliferation localized at the point at which the mucous membrane is most affected. It follows that the surface of the canal becomes irregular, presenting slight elevations which may reach several milli-

meters in height. Alongside of these are seen losses of substance, going down even to the submucosa, and readily producing slight hemorrhages; they are of rounded form and have as their origin a local process of desquamation. The epithelial proliferation gives rise to the formation of plaques more or less distinctly outlined, rounded, and of pearly gray color. They vary in dimension—at times being small and thin, having the dimensions of a pin's head and being barely distinguishable from the neighboring membrane; at other times they are several millimeters thick, up to one centimeter in length, and remain clearly perceptible in the midst of the surrounding tissues.

Finally, instead of giving rise to the formation of small plaques, the process of epithelial thickening may spread out to a much more considerable surface without finding points at which desquamation intervenes to cause loss of substance. We then find upon the whole extent of the diseased zones a thickened epithelial layer (*pachydermia*), and the membrane of a dull aspect, is irregular and of grayish color, allowing at times, by transparency, the reddish color of the mucosa to show through, so that the latter appears as though veiled or covered with a coating of dust.

Course and Cure.—Under the influence of appropriate treatment the lesions of the epithelium can, at times, become cured in a very short time. At other times, if the subjacent layers are strongly affected, the cure is much slower.

In the slightest cases a cure is obtained in five or six days by complete reparation of the lesions.

At a more advanced period, when the mucosa has taken on a rugose appearance, when we find small epithelial plaques which are slightly adherent and in process of desquamation, the irregular appearance is seen to become less and less perceptible under the influence of treatment as the underlying infiltrations become absorbed. The plaques of desquamation disappear, and the mucous mem-

brane becomes smooth; however, it remains for a long time without luster, and only takes on its shining aspect and normal transparency again after complete disappearance of all the other lesions.

Finally, the more or less extensive epithelial accumulations, constituting the most marked stage of the epithelial lesion, begin by losing the distinctness of their features. The grayish spots take on, little by little, a rosy color and thus imperceptibly disappear at the same time that the mucous membrane takes on again its brilliancy and transparency. But this only occurs after complete cure of the underlying lesions.

All the epithelial changes which we have described are scarcely met with excepting in the anterior urethra. They are not found in the posterior region whose epithelium is of a more delicate structure.

Even in the anterior urethra these lesions are much better marked when the canal is of a vigorous structure and the mucous membrane well supplied with blood. All the changes which the latter undergo are then well marked; while in anemic subjects they are less noticeable. Besides, if we examine for the first time a patient, who has already undergone treatment by means of sounds or bougies, the characters of the epithelial lesions are no longer so plain, although they may still be far from normal. Generally we find the surface of the lesions dull and nearly smooth, the epithelium having lost its transparency. This condition may persist for a long time.

We may further meet with two kinds of quite special lesions when it is a question of urethritis already subjected to treatment. We will describe them here:

1. These are *eschars* due to injections. The salts of zinc produce small white eschars from one to two millimeters in extent, which are found at the summit of mucous folds and which may persist for one or two weeks. Resorcin injections produce a sort of grayish white

shriveling which is irregular and extends over a certain extent of the canal. Finally, nitrate of silver gives to the mucous membrane a uniformly whitish aspect as if it were covered with a layer of dust.

2. *Argyrosis* is produced by the prolonged use of nitrate of silver. This salt is deposited in the epithelial layers and here gives rise to the productiou of bluish or blackish irregular plaques resembling little ink spots partially effaced. These are met with especially in the bulbar or in the penile portion. Or the argyria is localized at the orifices of the glands or lacunæ; here it produces small black circles. It may persist for years without any inconvenience.

III. *The Folds.* — The longitudinal folds which the urethral mucous membrane forms when it is more or less completely reflected upon itself, appears upon urethroscopic examination in the form of the radiating spokes of a wheel. They are the more numerous the larger the normal caliber of the canal; they unite in the center of the endoscopic image to form the central figure. We have seen that this central figure in the region of the glans penis has the appearance of an oval slit with its axis vertical. In the penile portion it appears in the form of a small pit, enlarging at times so as to form a transverse opening. In the region of the bulb the endoscopic figure is no longer regular, the lower wall projects decidedly, and when we come to the membraneous region, the upper wall scarcely appears any longer than a small surface distributed with what seem to be decidedly stretched folds.

It is in the neighborhood of the central figure that we best see the folds of the mucous membrane and can study their characters. They differ, however, very much according to the dimensions of the urethra and also according to whether we use a large endoscope whose introduction into the canal has the result of effacing them.

When the mucous membrane is diseased, its characters

of extensibility and elasticity being considerably modified, we should necessarily find parallel modifications in the folds which it forms.

In *simple mucous catarrh* the mucous membrane is uniformly thickened, the folds are larger, thicker, and less numerous than in the normal state; there are not over two or three, and these jut forth into the lumen of the canal so as to obstruct a view of the central figure.

1. In the first stage of *hard infiltration* their number diminishes notably; they even disappear in the dry form, while some still exist in the glandular form. Their complete disappearance in the latter corresponds to the beginning of the second degree. Under treatment the folds reappear slowly, here and there interrupted by periglandular infiltrations which may persist.

2. In the forms of *hard infiltration of the second group* the folds of the mucous membrane have wholly disappeared, at least in the midst of the patches; they may still be visible at the limits of the diseased zones where, as we have seen, the lesions are always less advanced. However, when the infiltration is not very dense, the surface of the mucous membrane, even in the center of plaques, does not appear absolutely smooth; it presents certain elevations which vaguely recall the folds of normal membrane. On the other hand, when the infiltration is very dense, the canal forms a sort of rigid tube which remains wide open when the urethroscope is withdrawn; then the folds, as well as the funnel which they form, and the central figure have completely disappeared.

When a cure is brought about it first shows at the periphery of the lesions where the broad rough folds appear; then it extends, little by little, to the whole diseased surface; but the folds only exceptionally take on again all of their former suppleness; there always remains, at least in their distribution, a certain rigidity which is found constantly.

3. The forms of *hard infiltration* which belong to the *third group* can be examined only after dilatation has been accomplished. We then see a sort of large and irregular folding progressively to reappear, which persists for a long time, and the folds which form after complete cure no longer present the extreme delicacy which characterizes the normal state. The infiltrations which belong to the purely simple dry form, however, again have quite fine folds when they have come to a state of complete cure. At the periphery of the areas the lesions are less pronounced and belong to the first or second degree; they behave as we have seen before.

IV. *Glands and Lacunæ of Morgagni.*—We have seen in studying the normal anatomy of the uretha, that we meet with quite numerous glands which may be divided into two classes:

The first class comprises isolated follicles which are invisible to the naked eye. These are without interest in endoscopic study.

The second class includes Littre glands or agglomerated acini, which are at times situated immediately below the epithelial surface of the mucous membrane; at other times much more deeply in the mucosa and even in the midst of the spongy tissue.

They vary in number and are not located at the same depth in the mucous membrane of all individuals. They unite in more or less compact groups. This contributes to emphasize the individual differences of the normal urethra, and to impress a peculiar character upon the course which gonorrhoic infection pursues in different patients. These glandular agglomerations are rarely visible in the normal state, in spite of their being very numerous and superficially situated. When they are situated within the mucous membrane they are not perceived unless they become diseased.

In the pathological state it is a rare thing for them to

be found isolated. They are in groups of four or five, forming at times thirty or forty small lenticular plaques which are especially noticeable because of the destruction of the superficial parts which cover them. At times, however, this covering, instead of being destroyed, persists, becomes thickened, and the whole evolution of the process remains hidden within the mucous tissue.

Finally, it may happen that the excretory ducts alone appear diseased on examination, in the absence of all glandular lesion properly so called. They then show themselves under the form of scarcely visible small impressions or indentations, of the same color as the neighboring tissues, and which are clearly made out in an oblique light by inclining the endoscopic tube laterally. We are confronted in this case with a lesion in process of cure, with a glandular inflammation of which there remains only a few traces and which is localized at the excretory ducts alone. In studying the lesions observed in Littre's glands, we see that these glands may either present only a simple mucous swelling, or else be invaded by a process of inflammatory infiltration, or still again, as we have already stated, their lesions may remain subepithelial and the whole process to have occurred in the mucosa itself.

a. Mucous catarrh, simple, is accompanied by an increase in the glandular secretion. This lesion usually characterizes the lightest forms of chronic urethritis, and is met with especially upon mucous membranes of very delicate structure. It, at times, accompanies the forms with well-marked hard infiltration, but then we would find it outside the bounds of the invaded areas, at the points where they are separated from the healthy tissue by a zone with slightly marked lesions; finally we meet with it in small isolated foci and surrounded by other foci of more deeply situated and older lesions. When Littre's glands present lesions of this form, the mucous membrane which covers them is pale red and slightly puffed out, the excre-

tory ducts, without being exactly dilated, remain, however, quite visible to the educated eye, and the neighboring membrane is slightly swollen. Besides, these lesions persist for a short time and may radically be cured.

b. Chronic inflammation is the lesion most frequently encountered. It is characterized by a fibrous infiltration of the glandular tissue and of the excretory duct, from which results an increase in volume which appears as a hypertrophy of the gland. The excretory duct becomes widely gaping.

This lesion, according to the conditions of individual resistance of the structure of the urethra, and the violence of infection, may invade the glands over a greater or less extent of the canal. At one time, in going over the whole urethra, we will meet with only a few glands decidedly swollen; at other times, on the contrary, we may encounter a large number of small glands which have attained a development much less considerable; or perhaps a mixture of these two forms. They may, besides, acquire a very considerable volume—one reaching such a degree that they might be confounded with the lacunæ of Morgagni if their number were not sufficient to render this mistake impossible. Their excretory duct, in the mildest cases, may appear as a scarcely discernible red point, still covered with a very thin, transparent film formed by the epithelial and connective layers of the mucous membrane.

Generally this covering is destroyed and the duct is laid bare, at least in its most superficial part. The borders are surrounded by a red zone and are raised above the surface, when the infiltration is well marked, above the level of the neighboring mucous membrane. The lumen is gaping, forming a small indentation surrounded by a bright red zone where the mucous membrane is congested and prominent. At times we may meet with a slight blood-effusion which forms a small blackish circle around the glandular orifice. But generally this blackish circle, when it exists, is due to

a local argyria which may affect this situation by preference, and persist here for several weeks.

Left to themselves, these lesions, by reason of the progressive invasion of the fibrous tissue, are little by little transformed, the gland becomes destroyed, leaving behind a circular connective-tissue cicatrix which then resists all attempts at treatment. In this case the orifice of the excretory duct remains widely open, but its borders become effaced, lose their bright red color and disappear in the surrounding tissue. Having reached this stage the glands of Littre remain indefinitely in the same condition. We find, at times, examples of this variety of glandular hypertrophy in cured urethræ in the midst of cicatrices which have become indifferent (*todte Narben*). Oberländer does not regard them as pathologic.

Subjected to treatment by dilatation, the glands, little by little, reassume their normal appearance; they appear first less numerous in regaining their structure and their physiologic function; only the epithelial covering, destroyed by the disease, naturally does not form again. As to the glands which have greatly increased in size under the influence of infiltration (hypertrophy), their cure takes place very slowly; it is often only after complete disappearance of all the other lesions that we see their gaping orifices gradually disappear. These orifices may even remain in the same condition despite all treatment. Furthermore, the glands continue to secrete even when they are in full morbid evolution, and the urinary *filaments* characteristic of gonorrhea are often nothing else than the result of this pathalogic activity.

But the glands of Littre, instead of occupying a superficial situation, can, on the contrary, be located more deeply in the mucous membrane and, consequently, covered over by a quite considerable thickness of tissue which the pathological process invades without destroying. The

inflammatory infiltration then brings about changes in the tissue of the gland and in the excretory canal, which we have already described; the excretory canal, however, becomes obstructed from the swelling of its walls and of the tissues covering it.

In this case, in examining the diseased regions, frequently no glandular orifices, or only very few, are seen because all the glands are not situated at the same depth; some being more superficial may remain quite visible and pass through their evolution, as we have already seen. When the excretory duct is thus obstructed, the gland itself becomes dilated and forms a small *cyst* of variable course according to the intensity of the process. When this is an acute one a small follicular abscess forms which evacuates on the surface of the membrane or, at other times, in the depths of the tissues themselves. When the process is less acute, instead of pus the cyst contains a colloid material. Little by little the excretory duct becomes again permeable. Generally, according to Oberländer, the cysts rupture into the surrounding connective tissue, and their products are resorbed. With a process still less acute, corresponds the formation of small cysts, which swell up only a little, do not open, and inevitably undergo subsequent cicatricial atrophy.

This form of chronic gonorrhea to which Oberländer has given the name of *dry* or *follicular urethritis*, is readily distinguished on endoscopic examination. When the diseased glands are relatively quite superficial and are found almost immediately beneath the epithelium, they project on the surface of the canal in the form of small, transparent vesicles which may reach the diameter of a hemp-seed. They are the less prominent the deeper in the midst of the mucous membranes they are located. The depth may be such that the glandular cysts no longer appear upon the surface, and their presence, owing to the compression which they exercise upon the superficial capil-

laries, is no longer shown except by a diminution of the color of the mucous membrane. We then find small, paler points; the mucous membrane which encloses the cysts seems rigid and does not fall into folds like healthy membrane, but appears withered and colorless.

We shall see, later on, that these dry forms of chronic urethritis are characterized by a tenacious and persistent suppuration, and that they are particularly rebellious to all treatment. To obtain a cure we must employ dilatation with patience and for a long time; and this treatment is the more indispensable as gonococci, whose virulence is not yet destroyed, may exist locked up in the cysts.

The lesions which we have just described are scarcely observed excepting in the anterior urethra, where the glands of Littre are particularly *numerous* and well developed. In the posterior urethra these glands are much *less* numerous and even at times are wholly absent. We have often observed them in the membraneous region, rarely in the region of the prostate; they are always of a much smaller volume, their excretory canal is extremely short, and their situation is very superficial. In chronic inflammation of this region they play a much less important rôle.

This is the chief reason why simple chronic posterior urethritis is much *rarer* than it is generally considered, and why it resists treatment a much shorter time than anterior urethritis. In reality, when posterior urethritis becomes tenacious and persistent it is because it is accomganied by prostatitis, by spermatocystitis, or by other deep-seated complications which we must overcome before we can obtain a cure of the urethra.

To resume: The lesions of Littre's glands characterize very well the different forms of chronic urethritis which we have mentioned at the beginning of this chapter; they have, furthermore, served in a measure as a basis for the classification which we have adopted. To recapitulate, this is what we find in the different degrees of urethritis:

A. SOFT INFILTRATION.—The glands of Littre do not show any appreciable lesion.

B. HARD INFILTRATION.—*First Degree; Glandular Form.*—The glands present only faintly marked lesions. We see them at times united in small groups, the borders a little redder than the surrounding tissue, are slightly swollen and surrounded by a red zone. The gland itself is surrounded by a zone of quite superficial infiltration which is scarcely visible even about the excretory duct. When cure has been effected we see the characteristic redness slowly disappear at the same time that the zone of peripheric infiltration is absorbed; this zone may, however, persist for quite a long time, especially when the infiltration tissue is quite dense. Cure is more rapid in the lower wall of the urethra; in the upper wall, on the contrary, it is slower, and it is upon this surface that we must always search for the last traces of the lesion.

Dry Form.—In this form the excretory ducts are entirely invisible, the membrane being occasionally scattered with small vesicles. When cure has resulted from dilatations, either the excretory duct opens again, or the glandular body ruptures within the tissue of the mucous membrane. This phase of the process is quite fugacious, but eventually a cure takes place. At times there remain after treatment a few follicles which are without importance so far as the cure is concerned. Cicatrices may also appear on the surface of the mucous membrane in the neighborhood of, but not immediately around, the excretory duct.

Second Degree; Glandular Form.—The diseased glands are always united in quite compact groups. Those which are situated in the center of these groups are the most severely attacked and are found more or less hypertrophied. Their excretory duct is generally swollen and surrounded by a reddish inflammatory zone. The glands themselves are swollen and surrounded by a zone of prominent infiltration.

It is very interesting at times to follow the process of cure. The glands then appear in consequence of the absorption of the infiltration which covers them, under the form of small glassy prominences, they are open and their contents are eliminated. The orifice by which this elimination is effected remains at times visible for a short time only; at other times this orifice persists for a long time, even after complete cure of the lesions of the neighborhood, and forms a sort of cup-like depression which can be emptied through pressure exerted by means of a pointed probe.

The lower wall of the canal is particularly the seat of this glandular hypertrophy. We will meet similar lesions in the lacunæ of Morgagni, and notice that they are situated with preference on the upper wall of the canal. Finally, after complete cure, the dead cicatrices still enclose a certain number of glandular groups which have remained visible.

Dry Form.—In this form the glands are never seen united into groups, and we meet with large surfaces over which they are invisible. The few glandular orifices which we perceive are quite frequently surrounded by cicatricial tissue. Following dilatations, we see this cicatricial tissue disappear, and the glandular orifices are found to be much more numerous and present a normal aspect without inflammatory lesions. There is also transition into the mixed form. At other times they rupture within the tissues and their contents are absorbed. As to the follicles which do not open, they may become completely encapsulated in fibrous tissue and thus become innocuous.

The *lacunæ Morgagni* present close analogies to the glands of Littre in form, nature, and endoscopic aspect of the lesions which one encounters. In the normal state and in a urethra of medium caliber, we perceive quite distinctly their orifices under the form of small pricks, like those from a needle and slightly open. They are of the

same color as the neighboring mucous membrane, or perhaps a little deeper colored, and at times we may perceive their oblique direction through the mucous membrane. In very vascular canals of large dimensions, and hidden between well-marked folds, the presence of lacunæ at times escape being seen on examination because they remain hidden between the folds of the mucous membrane. Finally, when the urethral mucous membrane is pale, they may also escape attention because of insufficient color. They are situated upon the superior wall, or upon the lateral walls of the urethra, where we find from three to eight of them. If we think, at times, that there are many more than these, or if they appear united in groups, there has been a mistake made in confounding them with the glands of Littre, which have become visible through pathological changes.

In the same way as the Littre glands, the lacunæ of Morgagni may present pathologically different forms. They may, like the former, be affected with simple mucous catarrh, or else be invaded by infiltration, with the simple difference that the elements are of greater size, and that their changes are more clearly visible and more marked. The lacunæ swell up, take on a deeper color, which is the more noticeable the paler the surrounding mucous membrane. The borders of the orifice also swell and take on a glassy aspect, then disappear as the infiltration becomes more marked and interferes with the neighboring circulation. The lacunar tumefaction forms at the surface of the mucous membrane a prominence which may reach the dimensions of a pea. Generally it appears as a nodule of the size of a pin's head, of red or of deep red color, on the summit or the sides of which we discover the orifice with borders swollen and translucid, throwing out, at times, products of mucous and purulent secretion. All of these details are seen less readily in a very large canal with mucous membrane well colored and with numerous folds,

whose swelling masks that of the lacunæ; but the compression exerted upon the neighboring vessels by the infiltration is then shown under the form of a small, pale, superficial macule. The evolution of the process is again analogous to what we have already seen at the Littre glands. The simple mucous catarrh may heal spontaneously, followed by *restitutio ad integrum;* but this fortunate result is rarely seen.

Generally the inflammation of the lacuna of Morgagni is accompanied by infiltration, at times even by suppuration; and in these two instances the process always ends in a more or less complete destruction of the anatomical elements. At times the orifice of the lacuna remains widely open and gaping in the midst of a red areola, and if it is not obstructed by products of secretion, it permits one to see quite distinctly the cavity of the lacuna itself, which is red and inflamed. At other times, as the retraction of the newly formed fibrous tissue takes place, the orifice contracts until it now forms a bright red point in the midst of surrounding sclerosed and pale tissue; it then absolutely resembles the orifice of a Littre gland.

Finally the sclerosis may appear quite clearly at the surface, and we see the orifice of the lacuna circumscribed by cicatricial fibrillæ radiating in every direction. Under the influence of dilatation, the orifice, now swollen and gaping, diminishes progressively in volume, becomes pale, and closes up little by little. At times it tears and is transformed into a fissure in the bottom of which one sees small, bright red points corresponding to the infiltrated orifices of the Littre glands which open in the lacunar cavity. At other times the lacuna ruptures and throws out its contents into the canal, but this is the exception.

The orifice may also become obstructed by cicatrization and give rise to the formation of *cysts* analogous to those of Littre's glands, constituting small red tumors standing out beyond the surface of the mucous mem-

brane. Upon their summit there is to be seen at times a diminutive depression, but the orifice is generally invisible.

As the process goes through its evolution and becomes less acute, the swelling diminishes and the nodosity thus formed becomes less visible—it is lost in the tissues of the mucous membrane. The appearance is then similar to that which we have seen in the same phase of the process in the glands of Littre: dry, follicular urethritis; discolored mucous membrane; cadaveric aspect. This phase may persist for a long time in spite of treatment. In palpating the urethra after a dilator has been introduced, we may feel the nodosities in the form of small hard points, somewhat rounded, disseminated in the midst of infiltration tissue. Thus slowly the contents of the cyst become condensed and the tissue, as a whole, atrophies, smothered, as it were, in fibrous retraction. This is the ordinary process of cure. Finally, dilatation can result in causing the cyst to burst upon the surface of the mucous membrane. There thus forms an excavation which is larger or smaller, according to circumstances, with detached border, and with bleeding surface which cicatricizes rapidly. Rarely can we perceive a similar evolution whose duration is very short, and which Oberländer himself has only observed about ten times. The complete and definite destruction of the lacunæ is the necessary consequence.

Cicatrices of the Urethra.—We have seen that chronic urethritis is cured by *absorption* of the products of infiltration of the mucous membrane. But it often happens that this absorption is not complete; foci may remain which often undergo complete evolution and are transformed into cicatricial tissue. This, in a certain way, is another form of cure. Such a transformation may be spontaneous, but requires an exceedingly long period of time to take effect; it takes place with much greater rapidity under the influence of treatment.

Such a cicatrix of the mucous membrane has the structure of typical cicatricial tissue; it is composed wholly of connective-tissue fibers, does no longer include any embryonic elements and is not capable of giving rise to recurrences of urethritis. When it begins to appear, we distinctly make out small fibrous bands, but in the terminal stage, it is entirely smooth, has no reticular appearance, and should be covered over with epithelium which is smooth and brilliant. This condition can always be distinguished by means of the endoscope, because it is less elastic than the normal tissue of the urethra, and the lumen of the canal remains patulous when, in withdrawing the urethroscopic tube, we traverse a zone where it predominates.

In other most simple forms such as are met with at times in the mucous membrane after cure of the soft infiltration, the linear or star-shaped cicatrices are only a few millimeters long and about one millimeter broad; they are distinguished by their pallor which makes them appear white in the midst of an anemic mucous surface, whitish, red, or yellowish when situated in a mucous surface which is highly vascular. This form is very rare.

Analogous cicatrices are met with also in the midst of zones of fibrous infiltration. They are often visible during the course of treatment; their number is also more considerable than in soft infiltrations. They may be accompanied by other cicatrices developed around the orifices of the Morgagni lacunæ and surrounding glandular orifices, but not in the immediate neighborhood of the latter as we have already stated in the previous chapter.

If the cure of soft infiltration can be accompanied by the formation of small cicatrices, there is all the more reason for its occurrence in hard infiltrations. When the latter are neither too dense, nor too deeply situated, we can, it is true, set up by dilatation complete resorption; but when once there is extensive infiltrations, invading

deeply the walls of the canal, complete absorption is no longer possible even by a prolonged course of treatment. A cure can no longer be produced, excepting by at least a partial transformation of the inflammatory tissue into cicatricial tissue.

These cicatrices appear at first under the form of trabeculæ, between whose meshes the remains of granular tissue often still persists; or as infiltrated glands and lacunæ and vascular arborizations of variable form and extent; they have a peculiar grayish brilliant color. By means of dilatation we, little by little, set up resorption of all embryonic tissue which they enclose; the cicatrices diminish in extent, become paler, are effaced and disappear at times in a progressive manner. But the large masses of infiltration occupy at times the semi-circumference of the urethra or more, persisting even until after a complete cure has been affected, and remain indelible. We find them on the lower wall of the canal, while small cicatrices, of which we have already spoken with reference to the glands and the lacunæ, naturally are found rather upon the upper wall. When they are no longer composed wholly of other than purely cicatricial tissue, no longer enclosing infiltration elements, they are called *dead* or *indifferent cicatrices*. (Oberländer). They are often absolutely smooth, brilliant, and covered over with a quite uniform epithelium. They no longer present any apparent trabecular structure and are directly continuous with the neighboring tissues without any visible protrusion.

Special Description of the Various Forms of Chronic Urethritis.—We have seen, successively, the chief lesions which the anatomic elements of the urethra present in the course of a chronic gonorrhea; we have also studied the appearances which these lesions present, and in what manner one may make the diagnosis by means of urethroscopic examination. We shall now pass in review some of the typical forms corresponding to the classes

which we have established; but we will draw attention to the fact that it is rare in practice to encounter entirely pure forms. While the most important lesions which are seen in a given case correspond, as a rule, quite closely to one of the types described, we will find alongside of these lesions which are somewhat secondary, and which cannot be at all attributed to the particular type. The course and form of chronic urethritis depends upon so many factors that we easily explain this absence of parallelism between the nature and evolution of the lesions which we may find in the same patient.

Soft Infiltration.— We have to deal here with simple parvicellular infiltration, attacking slowly the mucous membrane; hence the name *mucous urethritis* which Oberländer has given to it; and here we never meet with diminution in the caliber of the urethra. This permits us *a priori* to exclude this form, if the endoscopic tube normally introduced into the canal is arrested at any point of its course.

It is met with by preference in the most anterior portions of the penile urethra; it is more rarely localized at the bulb; and in the region of the glans it is recognized with great difficulty. It appears, in general, a short time after infection, when the acute period has passed through a relatively benign evolution. It passes unnoticed, on the contrary, under the influence of a very virulent infection, when the infiltration has invaded the deep tissues, or else when we have to do with quite delicate mucous membranes in which the infiltration readily passes from a torpid into a chronic form.

Through the endoscope the *mucosa* appears red and inflamed. A fact which immediately distinguishes this form from the hard infiltration is that the mucous membrane becomes paler under the influence of a vascular compression exerted by the fibrous tissue. The red color will be the more marked the more vascular is the mucous mem-

brane normally. Furthermore, the normal striations disappear completely in the midst of a generalized redness, or we see it only more or less at the borders of the inflamed zones; it reappears rapidly as cure takes place.

The *epithelial surface* then takes on a more brilliant aspect, as we have indicated in in the chapter treating on this point; then, according as the infiltration progresses, it loses little by little its polished surface, becomes opaque and finally becomes roughened when desquamation begins. It nevertheless always preserves its normal translucency. Once the latter becomes modified, it is a certain sign that there are severe lesions in the body of the mucous tissues. The various epithelial lesions which we have just described are found side by side upon the surface of the same plaque of infiltration, and may disappear in a few days with the greatest ease.

Finally it sometimes happens that the epithelium becomes completely desquamated and reveals the surface of the membrane and its papillae, thus giving rise to a small granular plaque which is in reality an excoriation that bleeds upon contact with the urethroscope. The cure of these small plaques is rapidly accomplished.

The *longitudinal folds* of the canal swell up, as does the whole mucous surface, and are thus less numerous than in the neighboring portions. We meet with three or four large red folds in the midst of numerous thin folds which form in another part of the normal mucous membrane; or the upper wall of the canal occupies the whole endoscopic field with one large prominent lacuna, while the lower wall is no longer seen. At other times the canal becomes very decidedly narrow, the folds which were few in the normal state are no longer at all visible, and the membrane appears only smooth, red, and swollen.

That which *distinguishes* in a definite manner the *soft infiltration* from the other forms of urethritis with hard infiltration is the fact that the mucous membrane *never* has

the feature of dryness and rigidity which distinguishes the latter; the *central figure* also never remains gaping but always closed immediately upon the withdrawal of the endoscope.

Littre's glands are scarcely affected, or at least their lesions are not visible because they remain covered over with an epithelial and subepithelial layer, whose destruction cannot take place except under the influence of a much more intense inflammatory process than that which characterizes a mucous urethritis.

As to the *lacunæ of Morgagni*, the catarrh which affects them is characterized by swelling and deep color which stands out in contrast to the neighboring mucous membrane. Their swollen orifices have borders of a glassy appearance and become indistinguishable by degrees, according to the density of the infiltration which takes place. The neighboring circulation is impeded.

This lacunar tumefaction thus forms upon the surface of the mucous membrane a projection which may reach the dimensions of a small pea. It generally appears as a red nodule of pin size upon whose summit, or on the side of which, we find the orifices whose borders are swollen and translucid, and through which at times are thrown off the products of mucous or purulent secretion. These nodules are less apparent in a highly colored urethra whose numerous folds are swelled and so mask the swelling of the lacunæ; but then the compression which the exudate exerts upon the neighboring vessels is shown in the form of small, pale superficial macules. We must, however, observe that these lesions of the lacuna of Morgagni are rare in simple catarrhal urethritis and, on the contrary, frequent in the hard forms. We must always be on guard, also, because of their presence in the midst of the zone of soft infiltration, that which causes us to suspect beneath the latter the existence of more severe lesions hidden by the benign superficial ones.

Clinical Details, Course, Cure.—Mucous urethritis shows itself about five or six weeks after the beginning of the infection; it is generally well cured by means of the usual injections. Dilatation carefully carried out, as soon as the acute phenomena disappear, gives the best results. After the first or second one, the inflammatory redness and mucous swelling disappear; the desquamative lesions of epithelium are somewhat resistant, but get well in a complete manner after a few weeks. Finally, when the cure seems complete we may still perceive some swollen lacunæ appearing upon the surface of the membrane under the form of small prominent points of pin-head size, above which the epithelium is hazy and irregular. A few supplementary dilatations are often necessary to assure their disappearance. Finally we must not forget that in the midst of zones of soft infiltration masked by mucous swelling, nodules of hard infiltration may be found, whose presence is only made out after the cure of the more superficial catarrhal lesion. These nodules are naturally of small dimensions, but they require a longer and more energetic treatment and we must know beforehand regarding this in order that we should not be taken unawares by their sudden and unexpected appearance.

Hard Infiltrations.—As their name indicates, the forms of infiltrations comprised under this denomination are distinguished by their hardness; the walls of the urethra, which are extremely elastic in the normal state lose this quality as soon as they are invaded by a fibrous infiltration, and this the more completely the greater the density of the fibrous tissue.

In light forms this hardness will be scarcely perceived or will be but imperfectly made out, while in the most pronounced forms the walls lose all of their elasticity and become resistant and cartilaginous. When we examine the canal we see that the hardened walls are no longer in folds as in the normal urethra, and the central figure, instead of closing as the endoscope is withdrawn, remains widely

gaping. The hard infiltrations never invade the urethra in a uniform manner; they have variable dimensions according to the extent of the zones where chronic inflammation has persisted. They penetrate more or less into the depth of the tissues, are interspersed with healthy tissue, and finally present cicatrices which we have already studied. Oberländer divides the hard or fibrous infiltrations into *three groups* according as the caliber of the urethra remains normal, or is narrowed more or less below 23 Charrière. This division is purely arbitrary, and the classical cases which we shall now describe are not met with in practice excepting when the examination of the canal can be made before any treatment has been begun. Once treatment has commenced, the endoscopic appearance of the urethra frequently changes; new foci of infiltration appear at points which seem to be healthy; old foci may continue to extend in depth without our being able to arrest the process.

At other times acute *recurrences* come up in the midst of the chronic state. Foci thus appear whose existence had not previously been expected; at the same time foci of acute inflammation may show themselves in the midst of zones attacked with chronic inflammation and, by preference, in glandular masses. These glands enter into a state of suppuration, and at times undergo complete purulent disintegration.

Recurrence is also frequent even during the course of treatment. Finally cure is brought about by slow disappearance of the lesion, or by transformation into cicatrices. Perhaps this cure is spontaneous. It is difficult to give an opinion upon this point. Patients who are not carefully treated are always exposed to recurrences; they generally exhibit a state of contagiousness, and may transmit their gonorrhea; finally they are threatened with all the usual accidents of ascending infections and strictures of the urethra.

Cure takes place slowly by appropriate treatment. The time necessary to bring it about depends upon the intensity of the process, the individual conditions, which are difficult to lay down, and finally upon the treatment followed. The latter is very long, with the exception of the very light cases where the inflammation is superficial and of slight density. When fibrous transformation begins, some months are required to arrive at a complete result.

Hard Infiltration of the First Degree.—When the parvicellular infiltration begins to undergo fibrous transformation, there is forming, little by little in the midst of inflammatory zones, a sort of hard nucleus, masked by catarrhal swelling in the neighboring parts. When this swelling disappears under the influence of appropriate treatment, we see the hard nucleus appear, which had remained hidden up to this time. Such forms constitute a transition between the soft infiltration and the hard ones.

Hard infiltration of the first degree comprises glandular forms and dry forms.

Glandular Form.—The mucous membrane is *pale* and *has lost its normal striation* in a more or less complete manner; these modifications are not uniformly distributed, but exist only at the points which are diseased. The *epithelium* desquamates in spots, takes on an irregular, dull aspect, becoming at times opaque and forming small grayish plaques. The *folds* of the mucous membrane become less numerous; we do not find more than two or three, and even they disappear almost completely upon such membranes which are normally not well supplied with folds. Their complete disappearance corresponds, however, to the second degree of infiltration. *Littre's glands* are affected with simple mucous swelling and appear as little groups with their orifices slightly congested and prominent. They are thus met with united, like a series of small pin-pricks in the midst of a fibrous white plaque. The *lacunæ* have

the dimensions of a pin's head and at times discharge a muco-purulent fluid. *Cicatrices* which appear in this form are but slightly visible. We find very small ones in the mucous membrane itself or surrounding the glands and the lacunæ. These latter disappear quite readily, while the cicatrices of the mucous membrane at times persist long after the cure of all the other diseased regions has taken place.

Course and Termination.—Cure does not take place with equal rapidity in the whole extent of the affected zones. Experience has clearly demonstrated that it always takes place, *ceteris paribus*, more rapidly upon the lower wall of the urethra than upon the upper. It would, therefore, be upon the latter that we must look for the last traces of the disease. We see, following treatment, that the membrane reassumes its normal color, the effaced striæ reappear quickly as the infiltration is absorbed. The epithelium again becomes even and shiny, the grayish plaques disappear, the folds become more and more numerous, while the mucous membrane regains its elasticity. The glands recover their normal features because the infiltration has not been sufficient to bring about their destruction; finally the swollen lacunæ dilate, their orifices become crater-like, and then take on their usual aspect although they may remain surrounded by a reddish circle which, however, has no importance.

Dry Form.—The diseased areas are *pale* and take on a uniformly yellowish gray aspect, as though mortified. The *striæ* remain visible, while the *epithelium* shows marked desquamation and the *folds* of the mucous membrane are completely effaced. The *glands of Littre* are invisible as well as the *lacunæ*, their lesions remaining in the sub-mucousa; however, in the course of the disease, some of them may open on the surface; they then present the lesions of simple inflammation.

Course and Termination.—Under the influence of treat-

ment all the features slowly disappear, but with much less rapidity than in the glandular form. The uniform grayish color, especially, persists for a long time, and the membrane does not take on its normal bright red aspect before the cure is complete. The epithelium, likewise, remains dull and lifeless for a long while and does not show its normal appearance until after complete disappearance of the subjacent infiltrations. Thus the epithelial characters, in intimate connection with the changes in the mucous membrane, offer the best sign of progress obtained by treatment, and a complete cure cannot be proclaimed until the surface of the mucous membrane has again become normal, quite smooth, moist, and shiny.

As to the glands, their lesions escape for the most part the endoscopic examination; under the influence of dilatations the excretory ducts open slowly, and their orifices become visible in more and more considerable number; they are slightly swollen and reddish, permitting the escape of pathological products formed in the glands, then again slowly disappear after cure. At times the glands being covered over with a more resisting layer, the latter does not give way at once to dilatations; the products then accumulate, raise up this covering, and form small, transparent *cysts* which end in breaking upon the surface of the mucous membrane. The orifice thus produced has its swelling subside gradually just as in the first case.

Finally, the cysts more deeply situated break in the midst of the mucosa, and their products are absorbed. Some of these cysts may even persist after complete cure; they are then enveloped in a resistant, fibrous capsule; their presence is not of much importance. At the same time that these glandular lesions are going through their evolution, small superficial cicatrices may form in the surrounding parts, but not generally in their immediate neighborhood. On the contrary, these cicatrices immediately surround the opening of the crypts. Just as in the

glandular form, when cure is completed, small white cicatrices may show themselves on the surface of the membrane, but their appearance is not at all constant.

Clinical Details.—From a clinical standpoint a few considerations are not lacking in interest. These forms of infiltration of the first degree generally show themselves two or three months after the beginning of infection. They may then remain stationary for months without undergoing any modification, on condition, be it understood, that no new infection occurs, that the patient commits no excesses of any kind, and that he carries out no energetic local treatment. At the expiration of a variable time, generally about a year, a sort of spontaneous cicatrization occurs, especially in the glandular forms, while the dry forms seem more resistant. At the same time that these *superficial cicatrices* show themselves, the caliber of the urethra may become slightly narrowed, especially when the infiltrations are located at the points which are already normally the most narrow in the canal. These strictures, which in subjects whose bladders are devoid of energy, may produce disturbances of miction, are cured with great rapidity; they are thus distinguished at first glance from true strictures of the urethra.

These forms are accompanied by a more or less abundant *suppuration* according to individual conditions which are difficult to define; suppuration, however, is quite often lacking in the dry form.

Hard Infiltration of the Second Degree.—Under this heading are included all instances of chronic urethritis in which infiltration has been sufficiently dense to cause an appreciable restriction of the caliber of the urethra, without, however, this stricture proving an obstacle to the passage of a number 23 endoscopic tube, the smallest we can employ.

This division is evidently arbitrary; we must, however, remark in this connection that urethræ which have

become too narrowed to admit the number 23 tube, at the first examination, or after one or two dilatations, are no longer affected simply with chronic urethritis. This urethritis is then complicated by a stricture in the true surgical sense of the word, and the diagnosis, the prognosis, and the treatment are decidedly modified.

The class of hard infiltration of the second degree includes the great majority of cases of simple chronic urethritis which come to us for treatment. We naturally do not here find lesions other than those found in the cases previously described; but these lesions are deeper, more extensive, and more severe.

Glandular Form.—The membrane is *pale* and *anemic* by reason of the compression exerted by the infiltration upon the vessels, and this pallor is especially well marked in vascular mucous membranes, while it is distinguished less well from the normal color in anemic membranes. We may notice here and there red outlines which are altogether wanting in the dry form. The *striation* has disappeared and is not found again, except upon the borders of the lesions, where there always exists a less-pronounced infiltration than in the center.

The *epithelium* may present a great variety of lesions. Less affected in the peripheral zones it will be slightly desquamating, or will present a simple, glassy swelling. On the other hand, in the center of the foci, where the lesions are more severe, we find grayish scales, more or less extensive and thickened. When the lesions are superficial, the desquamation is lighter and the surface of the membrane takes on an irregular aspect.

The *folds* disappear completely at the moment the infiltration is sufficiently dense; the thickened and hard membrane now forms one single mass with the sub-mucous tissue; it does not fall together, or fold in upon itself when the endoscope is withdrawn, but forms a sort of rigid tube which remains open. It recovers its mobility as the

infiltration is absorbed; at the same time it becomes more supple, and its surface begins to fold slightly at certain places, while large, prominent, hard nodules still remain at such points where improvement is less evident.

Littre's glands, whose excretory ducts are surrounded by a zone of connective hyperplasia, appear hypertrophied. They are united in groups and present all the forms of lesions of chronic inflammation which we have described.

The *lacunæ* are perceived at the first glance; they are surrounded by thick nodules of infiltration; the orifices are prominent, with borders swollen and glassy. The *tissue proper* of the *mucous membrane* is itself invaded by infiltration. At their periphery the areas present zones of soft infiltration, or of soft infiltration of the first degree; the severest lesions are at their center; here are also encountered small plaques of granular tissue, of which we have already spoken. These plaques are grayish, yellowish, of lardaceous appearance, almost completely deprived of glandular groups; they do not measure more than one or two centimeters in extent, are readily torn by the simple passage of the endoscope, and are surrounded by smooth, dry masses of deep infiltration in which are found swollen glands and lacunæ. *Cicatricial tissue* is rare; it belongs to the stage of regression.

Dry Form.—The dry form belonging to the second degree is much more frequent than the corresponding glandular form. We do not encounter granular areas such as we have just described. The infiltration is not localized in irregular foci, but it spreads out more uniformly over a certain area of surface of the mucous membrane; at times, also, over the whole length of the anterior urethra. The introduction of the urethroscope frequently permits one to note a peculiar resistance, and one which is characteristic to an experienced hand. This resistance is uniform and does not result in the series of sudden jumps produced by the irregular nodules found in the glandular form. To

make out the peculiar features of this form, one should select a case which has not yet been subjected to dilatation. The mucous membrane then seems uniformly yellowish gray, of cadaveric aspect; the *striæ*, still visible in the peripheral zones, have entirely disappeared at the points where infiltration is deep. The *epithelium* is dry, dull, without brilliancy; it undergoes a very fine desquamation and seems as though covered with a grayish dust which, however, urination or the injection of cocaine removes. The *folds* of the membrane have disappeared. The *glands of Littre* are invisible or appear here and there isolated and without areas of infiltration at the periphery. The *lacunæ* which one sees are small, scarcely surrounded by a slight reddish circle, and present neither prominent orifices nor nodules of perilacunar infiltration as in the preceding form.

In this dry form the infiltration has especially invaded the deeper parts of the mucous membrane; but the latter seems to have preserved its elasticity better than in the glandular form, and but *rarely* forms a rigid canal. It resists less the passage of the urethroscope, and returns to its previous condition more readily when the instrument is withdrawn, so that the central figure, while not closing completely, does not remain entirely open, and forms a sort of oval.

The infiltration, which is more regular than in the glandular form is, however, not entirely uniform; it has invaded more particularly certain points, which successively fall into the distal opening of the endoscope. We encounter neither granular foci nor cicatrices. These latter only appear as the cure is effected.

Course and Termination.—Cure in the infiltrations of this degree is never obtained without being interrupted by *recurrences*. It is always extremely slow, and the manifestations, which are produced as improvement goes on, present infinite variations.

In the *glandular form* we see the *normal color* and the *striæ* reappear slowly as the infiltration tissue is absorbed; the contour of the diseased zones becomes less and less clearly marked, and the central focus breaks up, as it were, into small nodules of which the smallest progressively melt down, while the larger resist and end by dividing up into indifferent cicatrices. The *epithelium* at the same time slowly regains its normal features, but remains, however, for a long time irregular and opaque near the persistent nodules and the cicatrices.

At the same time that the infiltration diminishes in density, the *folds* of the membrane are seen to reappear. These folds are very coarse at the beginning; they remain in this state for a long while, at times indefinitely, when large cicatrices are formed.

The *Littre glands* and the *lacunæ* begin by opening widely under the influence of dilatation; their orifices become crater-like, then disappear gradually by becoming invisible, either by reason of complete cure, or through atrophy and destruction of the gland. At other times, on the contrary, the orifices remain visible for a long time surrounded by a red circle. Finally, small annular cicatrices may form around the lacunæ, or about the glandular groups, then disappear by a continuation of the process of resorption.

These phenomena which we have described at greater length in the appropriate chapter, are observed by preference, as far as the glands are concerned, in the lower wall of the canal, and in regard of the lacunæ on the upper wall. After complete cure, when only a few indifferent cicatrices remain, we also see a certain number of glands or lacunæ persist; the normal aspect of their orifices, the absence of infiltration in their surroundings, and especially the character of the epithelium covering them, indicate that they are completely cured. We find them, especially in this state, on the surface of dead cicatrices. As to the mucous

membrane itself, the process of cure varies very much according to the extent of the infiltrations which have invaded it. If we have to do with superficial lesions, treatment by dilatation may provoke complete absorption without any cicatricial formation. These same infiltrations left to themselves tend, however, to undergo little by little their transformation into fibrous tissue. The reticulated cicatrices, which are gray and brilliant, with little vascular arborizations, and scattered with glands and lacunæ, soon appear upon the surface of the mucosa, or we see a net-work of varying dimension, with thick trabeculæ at times raised, and even forming a prominent nodule in the lumen of the canal. This form of a fibrous plexus is also observed during spontaneous cicatrization of the granulation tissue. The meshes are the more voluminous the deeper the infiltration; then they retract according as the parvicellular infiltration is absorbed, and it is transformed into white cicatrices. As to the large nodular masses which at times take in half the circumference of the urethra, they do not disappear as quickly because they are composed of encapsulated glandular masses in fibrous tissue, which resist treatment longer.

All these processes of cicatrization are enormously accelerated under the influence of a proper course of treatment with *dilators*. The superficial infiltrations are rapidly absorbed, and we see the *folds* of the membrane reappear again. We even see the process of resorption going on in the deeper infiltrations, around the traumatisms and slight tears due to the dilatation. The cicatricial tissue in process of formation can thus become absorbed; but the large nodules developed about the glands resist the action of the dilators for a longer time.

In the *dry form*, the process of cure is analogous, but its course is always very slow. As the infiltration tissue is absorbed, the mucous membrane is seen to take on a brighter color and to gradually lose its characteristic yel-

lowish gray appearance; at the same time faintly marked *striæ* reappear. The *epithelium*, which is irregular and dull, retains this feature for a long time, and does not take on again its glistening and clear aspect until complete cure is established; the mucous membrane loses this stiffness, or rather this absence of elasticity which caused an obstacle to the introduction of the endoscope.

As to the *glands* and *lacunæ*, their fate varies somewhat according to the deeper or more superficial inflammation in the tissue of the mucosa. The most superficial, under the influence of dilatations, open upon the surface of the mucous membrane, and their subsequent course is run as in the glandular form; the peripheric engorgement is little by little absorbed, and cure takes place. Cysts more deeply situated rupture within the mucous membrane and thus disappear. We see the white nodules with which the canal was strewn disappear by degrees. A few, however, remain. These may become completely encapsulated within the cicatricial tissue and become harmless; others should be destroyed by caustics or *electrolysis*.

The *cicatricial tissue* is only seen in the dry form during the period of regression. We see small cicatrices appear about the glandular orifices; others form in the depth of the mucosa by fibrous retraction of the follicles. During the course of treatment acute recurrences are, so to speak, sure to come in both forms, but especially in the dry.

Cure is secured only by perseverance. When it is complete, the older foci should again present the following features: The mucous membrane should again have assumed an almost normal color, and the epithelium, aside from a few plaques which have become indelible, should be smooth, moist, and transparent; the striæ should have formed again, and the mucous membrane should fold upon itself almost as though it had again taken on its primitive elasticity. The lacunæ and the glands remaining visible should have a normal, not projecting, orifice, presenting no

inflammatory features. It may happen that some periglandular infiltrations still persist, but they should be superficial and covered over with normal epithelium. The cicatrices, if any exist, should be superficial, smooth, and covered with a healthy epithelium.

Clinical Details.—The hard infiltrations of the second degree, which are also accompanied by a slight diminution in the caliber of the urethra, are only observed two or three months after infection. At times their formation is not preceded by a truly acute period, and we are quite astonished to find them in patients who, without having had a true clap, have complained for some time of itchiness within the canal, accompanied by a slight moisture at the meatus. Generally these infiltrations are formed slowly after an acute urethritis apparently cured, and give rise, subsequently, to so-called new attacks of urethritis. Once formed, these infiltrations are no longer spontaneously absorbed. They may extend very slowly at the same time as there appears at their center a gradual process of cicatrization which we have described and which continues for years. They may also pass into the third degree and thus constitute strictures properly so called.

The cure is obtained under the influence of appropriate treatment, but this treatment will be necessarily very slow, especially in the dry form in which a year or more may be required.

Hard Infiltrations of the Third Degree — Strictures of the Urethra.—We have arranged in this group all the cases in which the infiltration is so dense that the urethroscopic tube number 23 can not pass into the canal. This division may appear entirely arbitrary; indeed it is so from a purely scientific point of view. The infiltrations which belong to this group are not to be differentiated from those we have already seen, excepting by their greater density; but they have a practical importance which is quite considerable.

Most practitioners, indeed, treat strictures of the urethra in an incomplete manner, once they have reached a caliber which seems to them sufficient—and number 23 Ch. is here very often a high number—they abandon the stricture to itself, and wait patiently for the early recurrence which is bound to follow.

Now it is precisely at this moment that the true treatment of the affection begins, because it is only now we can take exact account of the state of the canal and follow, pace by pace, the progress of cure until the latter is complete and definite.

Stricture of the canal does not differ in any way from an anatoma-pathologic standpoint from the infiltration which we have described in the preceding paragraphs; it is simply a more advanced degree of the same lesion, and is characterized by the presence of a more dense infiltration. We must then *a priori* admit that the process of cure will pass through the same phases, with a slower course, undoubtedly, but terminating finally with the same result, viz: resorption, as complete as possible, of the infiltration tissue; integral transformation of all that which can no longer be resorbed into indifferent cicatricial tissue. The latter is characterized by the absence of all inflammatory element; it has become incapable of giving rise to a recurrence; that is to say to a new access of inflammation. At this moment, only, the cure will be complete and definite.

The formation of an infiltration, which is accompanied by stricture of the canal, is not characterized by any particular phenomenon. It always requires at least several months, at times years; it is made active by frequent recurrences of urethritis. We see at times, even in the course of treatment, that the infiltration extends in spite of all efforts. We are thus forced to be silent lookers-on during the formation of a stricture which we can begin to combat only at a later date. If we have before us a narrowing of the canal, we must begin by making dilatation

according to the ordinary rules until we can pass a number 23. We must then examine, with the urethroscope, by employing a tube well smeared with glycerin, which we slowly introduce while holding the penis with the left hand. If it does not pass, we attempt to incline the tube from one to the other side, so as to pass alongside of large callous masses situated at times laterally; we should use no force, so as to avoid hemorrhage, which might make the examination impossible, or at least compel us to put it off for from fifteen to twenty days.

The anterior urethra may be infiltrated to the bulb, and we find this infiltration irregularly distributed. It is much more intense in certain points, which form the strictures. These are located generally in the middle portion of the anterior urethra, or frequently, also, in the region of the bulb, and especially immediately behind the latter at the entrance of the membranous region. The strictures which are situated at this point readily set up marked troubles of micturition. This peculiarity is due to their situation and also to the fact that the muscular fibres of Carcassoune's aponeurosis are invaded by the sclerogenic process. These strictures also form the chief obstacle to catheterism, and are for this reason the best known by surgeons. They are rarely encountered at the meatus. Finally, it is exceptional to find a canal, healthy in the greater part of its extent, to show at a single point an isolated stricture.

The stricture itself is formed of large masses of dense and compact connective tissue, in which the vessels are compressed and the circulation very sluggish. The *mucous membrane* also is colorless, whitish gray, or of cartilaginous aspect, covered with a thick *epithelium* (pachydermia). It presents no longer either *folds* or *striæ*, excepting in the peripheric zones of lesions less advanced, and forms a sort of rigid canal whose central figure remains *open*. The caliber of the canal being diminished at the level of the

stricture, the endoscopic tube is violently repelled during the examination of the canal, and the masses of infiltration suddenly pass before the eyes. The preceding dilatations have always produced a tear which is seen in the form of an elongated fissure, at least in the neighborhood of the stricture. In the tissue of the stricture itself the tear may have been sub-epithelial, and not apparent at the surface at all. The *glands* and *lacunæ* are generally not visible at this period; they are scarcely to be encountered except in the parts relatively less affected, situated between the largest foci. But it happens occasionally, however, that diseased groups of glands are seen even in the midst of the fibrous masses of the stricture.

The dry form is scarcely to be distinguished from the glandular. The masses of infiltration themselves are irregularly distributed; to recognize distinctly their appearance, extent, and thickness, we must be able to employ a number 25 tube, and draw it out slowly, stopping at the moment when it passes through the strictured points, where it is opposed by the large and projecting nodules. We will see in this way that the infiltrated masses never occupy the whole circumference of the canal. Even in the most pronounced strictures they scarcely extend beyond a third or a half of this circumference.

Course and Termination.—Strictures of the urethra can, up to a certain point, become spontaneously cured. This spontaneous cure does not extend to a *restitutio ad integrum*, but such has been capable of demonstration in patients who have never undergone any local treatment. It would seem then that the chronic inflammatory process becomes arrested, and that the lesion no longer spreads either on the surface or down into the tissues. The infiltration tissue is absorbed at the periphery, while in the center it is transformed into cicatricial tissue. If one has an opportunity to examine one of these cases it is seen that the lesion is directly continuous with the healthy tissue; that

the stricture itself, which has but a minimal extent, and scarcely admits the number 23 tube, is distinguished from the normal mucous membrane, because its pale rose, smooth surface, without folds, is traversed by deep cicatrices having at times a width of 0.005; that it has a fibrillary appearance, but does not enclose either diseased glands or remnants of normal mucous membrane. When strictures are subjected to an appropriate treatment the process gradually retrocedes. The *normal color* of the membrane returns only after complete cure. We first see disappear the red spots of the glandular form, but the grayish pachydermic appearance persists for a very long time, and disappears only with the progress of resorption. Even after cure, old strictures are always distinguished by a pale color at points where cicatrices persist. It is also rare to see a complete return of the normal *striation*, except in the peripheral zones. The pachydermic *epithelium* of the glandular form slowly desquamates, and this desquamation becomes more and more fine and delicate, so that we see the phases described in the preceding forms slowly gone through again. In the dry forms the epithelium keeps its dusty aspect for a long time before giving way to a smooth and transparent coating.

However it almost never takes on again its wholly normal features at the site of a cured stricture, and often after years it has preserved a rugose aspect, which permits of its recognition. As to the mucous membrane itself, it is rare to observe a reappearance of the thin, pliant folds which it normally possessed; according as the resorption is produced, these folds appear in the peripheric zones, then very slowly and gradually show themselves at the point of stricture; but they are coarse and thickened in the glandular form, finer in the dry form, without ever presenting anew an entirely normal aspect. At the same time we see these large foci of infiltration, which are quite visible in the period of their full development, diminish little by

little in volume, become less and less thick, and no longer project so forcibly into the endoscopic field; the canal then becomes freer, although its normal elasticity does not reappear so quickly. Soon *cicatrices* appear, at first large and numerous, forming meshes which encircle the urethra, then they diminish slowly in volume, become fragmented, and disappear partially by resorption; but a few always persist under the form of small white bands surrounding the large follicular areas. Alongside of these cicatrices others are found which are formed by the longitudinal tears which dilatation produces; these are broader and deeper, not having the fibrillary aspect of the others. They cut the stricture directly at the point where the most resistant masses exist, and one can see that it is in their neighborhood that the process of resorption is the best marked, because it is there that we see the first cicatrices appear, and the mucous membrane first take on again its characteristic folds. Finally the *glands* and *lacunæ*, which are scarcely seen in the midst of the fibrous masses of the stricture, reappear gradually and pass on to cure, in going through the various phases described in the paragraph dealing with the smaller infiltrations.

The time accorded to treatment of strictures should be an extremely long one. We cannot abandon them before the canal has become entirely free; the mucous membrane should have recovered its normal color, the epithelium should no longer present plaques of desquamation, it should be uniformly brilliant, the glands should no longer be surrounded by areas of infiltration, the cicatrices should no longer project nor present a reticulate appearance; finally, the canal should fall into folds in an almost normal manner. If follicular areas or infiltration nodules still persist, it will be well to suspend treatment for some months, to take it up again later. When a recurrence has taken place it will be readily noticed by the diminution in caliber of the canal. We also

note the resistance experienced in introducing the usual-sized urethroscope, and especially the difficulties which dilatation will present and the pain it will produce. The mucous membrane will show reddened plaques scattered over with pachydermic points; the infiltrations, which had diminished, will again become prominent, especially about the glands and cicatrices. But under the influence of an appropriate treatment these recurrences readily give way. We must, however, especially if they are frequent, *keep the case under observation for years*. There are few strictures which do not show some recurrences; these occur in subjects of some diathesis, such as the tuberculous, etc. We should then bring into our treatment as much patience and perseverance as possible, if indeed the patient is not lost sight of before the cure is complete. We must never give up the treatment of a stricture before such cure has been obtained, else the recurrence is assured.

We have seen that even with prolonged treatment it is impossible to give to the mucous membrane all its normal features again, but we are in a position to exact at least the total and definite disappearance of chronic inflammatory lesions capable of being the point of departure for new inflammatory outbreaks and, without doubt, of a *reinfection*.

IV. Endoscopy of the Posterior Urethra. — The posterior urethra (membranous and prostatic portion) is clearly defined and differentiated from the anterior part of the canal. Its structure and its physiologic rôle are both different. We have seen that the clinical symptoms of urethritis change entirely once it is attacked. The urethroscopic study is quite different. Therefore we have thought best to give to this study our special consideration. The urethroscopic examination of the posterior urethra is made much more rarely than the examination of the anterior portion of the canal, because chronic gonorrhea which becomes *localized here much less often* than we are apt to think, has a tendency to invade the annexed glands rather

than the surface of the mucous membrane itself. Furthermore, as this examination is, as a general rule, quite disagreeable to the patient, we must guard against unnecessarily having recourse to it, and *refrain* from it absolutely if the affection still presents some *features of the acute stage*. An almost absolute contra-indication is found in tuberculosis and prostatic hypertrophy. When we wish to employ the urethroscope for examination of this region, we must begin with a quite complete anesthesia. We should use from one-half to one gram of a ten per cent cocaine solution. We could even employ stronger solutions, in case of necessity going up to forty per cent. The effect is obtained only after some twelve minutes.

Endoscopic tube number 23 is insufficient for a detailed examination of the region; it can serve only as a means for a general observation, and it is indispensable to begin with it. Later on, when the sensitiveness of the canal becomes somewhat blunted, we may take numbers 25 and 27, which will give more precise details.

The patient should lie comfortably stretched out upon an examination table sufficiently raised for the ease of the operator, the legs bent and separated, the pelvis slightly raised.

Oberländer has constructed a jointed obturator, permitting it on the one hand to bend at an elbow so as to give to the urethroscope, at the time of introduction, approximately the form of a curved sound and, on the other hand, to be straightened out again when it is to be withdrawn from the urethroscopic tube (Fig 10). But we believe that this instrument is unnecessary, and we prefer to use the ordinary obturator. This is, however, a matter of personal preference. The method of catheterization with a straight instrument is, in general, not difficult. We begin by introducing the instrument into the anterior urethra until its point has reached the bottom of the bulbar

region and strikes against the perineal aponeurosis; the handle is then slowly lowered so as to slightly raise the point and direct it toward the opening of the membranous region. By means of a very slight pressure we then push the sound into the membranous urethra, and continue in this manner to cause its slow advance by lowering the handle at the same time, and thus straightening by degrees the curve of the canal. This manipulation, when well executed, aside from the slight pain which the passage of a bougie always causes in this region, provokes only a sensation of tension by no means intolerable. We encounter difficulty only if the movement of depressing the handle is insufficient and if the point of the urethroscope catches in traversing the ridge of the verumontanum projecting upon the lower wall.

Having reached the bladder, we withdraw the obturator. A preceding catheterization has emptied the organ, and small pledgets of cotton on holders are now sufficient to remove the remnants of urine. The urethroscope is now slowly withdrawn. When we thus come back into the canal, the funnel formed by the mucous membrane appears at once; this aspect is quite different from that which one observes as long as the instrument remains in the bladder; it is thus an easy matter for one to know his whereabouts. The examination made in this manner is directed successively to the region situated behind the verumontanum and to the verumontanum itself in its whole extent.

These manipulations are almost always accompanied by a slight hemorrhage, at least at the first examination; if these hemorrhages occur repeatedly afterward, they are indicative of superficial lesions (epithelial lesions, granulations, papillomata, etc,).

The diagnosis of the lesions one meets with in the posterior urethra, and especially in the region of the verumontanum, exacts a decided dexterity in the examination of this region. We may encounter not only lesions produced

by old gonorrheas, but also anatomical changes brought about by sexual excesses of all kinds. Generally the lesions found in this situation are due to a concurrence of these two factors. The existence of gonorrhoic lesions in the anterior portions of the canal — which should, by the way, have been already studied and cared for before going further back—will often come in to clear up the diagnosis which might otherwise remain in doubt. Besides, the chronic lesions of the posterior urethra are only very rarely limited to the mucous surface. In the great majority of instances they have invaded, at the same time, the genital glands (prostate, testicles, seminal vesicles, etc.). These are the complications which have for us the greatest importance; because the lesions of the mucous membrane, when they exist alone, get well, as a rule, quite rapidly.

The Posterior Urethra in the Normal State.—The mucous membrane of the posterior urethra is distinguished by its extreme delicacy; it is of a brighter color than that of the anterior part, of slightly dull aspect, and forms small, very thin folds when the urethroscope is drawn out slowly. The verumontanum presents at points particular interest. Its dimensions, its aspect, and even its situation are far from being constant. In making a urethroscopic examination, we see it projecting from the inferior wall of the canal under the form of a rounded protuberance of the dimension of a lentil, and of a yellowish rose color. This aspect, as the tube is withdrawn, extends over a stretch of from one to one and a half centimeters; the projection becomes smaller and smaller, and then becomes wholly effaced. The dimensions of the verumontanum are generally in relation with the dimensions of the canal; in a weak individual, whose penis is but slightly developed, it is scarcely a centimeter in length, and the projection it makes into the urethroscope is only slightly marked. In a vigorous individual it is longer, and forms a projection

strongly marked, which cannot escape examination. Toward the anterior extremity and on the sides of the verumontanum are seen the orifices of the prostatic ducts. These are small punctiform cavities less marked than the orifices of the Morgagni lacunæ, and do often escape examination. The orifices of the ejaculatory canals are of much more considerable dimensions; however, it is difficult to perceive them; they are found upon either side of the verumontanum. The entrance to the prostatic utricle is more easily distinguished, and we can find it quite readily in employing a tube of appropriate dimensions.

When, after this complete examination, we continue to slowly withdraw the urethroscope, we see the verumontanum stretched out upon the inferior wall in the form of a ridge, the latter at times reaches even to the region of the bulb. In the membraneous portion the mucosa is fine and very vascular. It appears, through the endoscope, of a bright red color forming radiating folds extremely delicate and numerous.

At the moment when the urethroscope penetrates the region of the membranous sphincter, it is pushed upward by the tonic contraction of this muscle. This contraction compresses the vessels and gives to the mucous membrane a peculiar aspect; it seems anemic, dull, and withered. Then the canal enlarges to form the bulbar region. At this point we distinguish, at times, a slight elevation whose aspect recalls somewhat that of the verumontanum, but whose dimensions are much less. We see a few small orifices analogous to those of the prostatic ducts. This prominence seems to correspond to the origin of the ducts coming from the glands of Cooper. (Oberländer).

Pathology of Posterior Urethritis.— Chronic posterior urethritis is, like the anterior, characterized by the formation and evolution, in the midst of the mucous membrane, of an infiltration composed of embryonic cells which tend to become transformed into fibrous tissue. These infiltra-

tions are also divided into soft infiltrations and in those which are hard and fibrous.

The soft infiltrations are frequent; they are found after acute urethritis, and have a marked tendency toward spontaneous cure when they are not accompanied by any prostatic or other complication. They are found localized sometimes at the verumontanum alone, and without any other lesions being discoverable through the whole extent of the urethra. In this case we must exclude gonorrhea and accuse other factors—masturbation, for example.

The hard infiltrations succeed the soft ones, and they may invade the whole posterior urethra; but we especially find them in the membranous region, and in this case they follow the infiltration of the bulbar region.

We shall presently see the modifications which the urethroscopic picture of the various elements of the urethral mucous membrane undergoes when it is invaded by chronic inflammation; we will then study, as we did in the anterior urethra, the various forms of chronic posterior urethritis.

I. *The color* of the membrane is the first to suffer changes. When it is the seat of a *soft infiltration*, its color, normally blood-red, becomes a dull red, in some cases almost cyanotic; it also loses its luster. When cure has been effected, the membrane rapidly takes on again its polished aspect, and then gradually its normal color.

When it is invaded by a *hard infiltration*, the membranous region takes on a grayish red color, even a slightly yellow one; its brilliant luster disappears to make room for a dull, dry aspect, without reflex.

When the infiltration is in the prostatic region, the features are less distinct, the color remains rosy, scattered with bright red normal plaques. The verumontanum presents analogous features, but its anterior extremity seems flattened and does not project from the inferior wall of the canal.

II. *Epithelium* in the posterior urethra is much more

delicate than the covering of the anterior portion of the canal, and is composed of several superimposed layers, forming a transition between stratified cylindrical epithelium and the flat epithelium of the bladder. In *soft infiltration* this epithelium is simply swollen. In *hard infiltration* it desquamates readily; the mucous membrane is at times also denuded over a very considerable extent, and it is to this complete desquamation that we must attribute the hemorrhages which are so readily produced during the introduction of the urethroscope. At other times, on the contrary, the membrane is indurated and covered with a finely granular epithelium analogous to that met with in the dry forms of anterior urethritis. Finally, the epithelium may become pachydermic, and the canal forms a tube of pearly white color.

Here we encounter granulations very frequently, more pronounced even than those of the anterior urethra, which should be regarded as the origin of the *papillomata* which are so frequent in this region. When cure has taken place, these characters become gradually obliterated as the infiltration of the mucosa becomes absorbed.

III. *The folds* of the mucous membrane are seen almost only in the membranous region; they become larger under the influence of a soft infiltration; and, on the contrary, they are no longer to be found when the mucous membrane has become indurated by reason of fibrous infiltration. The wall of the urethra, especially in the membranous region, is then smooth, for the nodular masses are not so prominent in the posterior as in the anterior region of the urethra.

The folds return as cure is effected, and this takes place with considerable rapidity, for the treatment is much shorter than that called for by analogous lesions situated in the anterior urethra.

IV. *The Glands.—Littre's glands* are few in number and but slightly developed. Their lesions are the same as

in the anterior urethra but much less well marked and without great pathological importance. The *genital glands*, on the contrary, are of great importance, and are the object of quite a special study. We mention them here only because the orifices of their excretory ducts open in the posterior urethra, and are there visible through the urethroscope. These orifices are inflamed and surrounded by a reddish zone. The largest among them is the orifice of the prostatic utricle; the orifices of the prostatic ducts are also generally seen; those of the ejaculatory ducts are more difficult to see because they are generally hidden by the swelling of the verumontanum. At times these orifices, instead of being simply inflamed, are choked up by fibrous infiltration; they are then distinguished with greater difficulty and appear small and closed, surrounded by a slightly reddened areola.

V. *The Verumontanum* constitutes the most important part of this region. When it is the seat of soft infiltration it swells, becomes dull red and cyanotic; its surface loses its smooth aspect, becomes, as it were, wrinkled, forming at times one or two deep folds. These characters disappear simultaneously when cure takes place.

When the infiltration is hard, the verumontanum is flattened and of yellowish color; the surface is dull and without glare, as though dried out. At other times it is deformed by cicatrices; this is especially noticeable after old prostatitis. When the infiltration of the verumontanum spreads out also to the neighborhood, the cure is slow; but gradually the red color returns, to be followed by a bright red. At any rate it never again recovers its rounded and projecting appearance.

Let us now study the various forms of chronic urethritis that we may encounter in this situation.

a. Soft Infiltration.—This form of urethritis is the slightest, and the one which is most readily cured. The mucous membrane in the membranous region becomes

dull red and loses its normal brilliancy; the folds which it forms are swollen. The glands of Littre, which are, by the way, few in number, have increased in size and present the features which we have described in the corresponding stage of anterior urethritis.

The verumontanum is of equally dull red color and slightly swollen, but this swelling is quite difficult of recognition because of the very variable dimensions of the organ itself in different individuals. All these features disappear, however, very rapidly when cure takes place. When it passes over into the hard form we encounter what may be called transition forms. The membranous region is then cyanotic, the folds are no longer distinguishable, but the turgescent mucous membrane projects forcibly into the lumen of the urethroscopic tube. The epithelium is still intact and simply swollen.

The verumontanum is clearly enlarged, of bluish red color, and more or less deeply plaited. The orifice of the prostatic utricle is gaping and inflamed, but the swelling of the verumontanum is at times so pronounced that this orifice, as well as those of the ejaculatory ducts, is lost in the tissue of the mucous membrane and remains hidden from view. When we can see these openings and those of the prostatic glands, they appear red, swollen, and surrounded by a prominent border.

When cure takes place it *begins* in the membranous region, which takes on slowly its normal features, while the redness and swelling of the verumontanum persists for a longer time. When the surrounding mucous membrane has recovered its habitual appearance, the cure extends slowly to the vermontanum by finally losing all its morbid features within a few weeks. Acute recurrences are always possible in the course of treatment; they are almost inevitable when the genital glands are affected. Therefore *the treatment of these glands should precede the treatment for the urethritis, or at least they should be simultaneous.*

This form of chronic posterior urethritis causes the same symptoms as vesical catarrh; it is especially important because it is frequently the origin of nervous troubles. It appears at times a few weeks after the onset of the disease; it may also appear much later, when severe lesions exist in the anterior portion of the canal, constituting a complication of these lesions.

b. Hard Infiltrations. — The forms which result from the fibrous transformation of the infiltration are much less frequent in the posterior urethra than in the anterior part of the canal. This difference arises especially from the absence of conditions which favor the passage into the chronic state, and notably from the *lack* of Littre glands and of lacunæ. Here we do not find the glandular forms of anterior urethritis. All the forms resemble the dry forms.

First Degree.—The mucous surface of the membranous portion seems dried out, as though it had lost its polish and brilliancy, is of grayish rose color, or even grayish yellow. The epithelium is desquamating. These characters are found in the prostatic region, but they are less pronounced, and we even see in spots the normal color of the membrane. The verumontanum is flattened, pale and, as it were, withered; the openings of the glandular ducts are small, slightly reddened, surrounded by an areola and, at times, emitting a discharge of viscid fluid.

Second Degree.—In this form as well as in the form of the *third degree*, we must first dilate the canal before being able to introduce into it a number 25 urethroscope. This preliminary dilatation is, at times, of considerable duration. When we then proceed with the examination, we find numerous flattened cicatrices which are pale, dry, and quite analogous to those we find in the anterior follicular urethritis. These cicatrices exist in the membranous region as well as in the prostatic region, where they invade even the verumontanum and go so far as the vesical orifice.

They are, at times, much developed without, however, reaching the dimensions of the fibrous masses which form the strictures of the anterior region. They are generally found to be already in the atrophic state, so that we do not find them projecting into the lumen of the urethroscope, nor presenting the reticulate appearance and the follicular foci of the anterior strictures.

At times, however, the posterior strictures are greatly developed and form, by the rigidity of their wall, even when they have already been well dilated, an almost absolute obstacle to the entrance of the urethroscope. If, however, we succeed in passing it we find all the characteristics of large strictures of the anterior part. The endoscope traverses a rigid tube of rosy yellow or pearly white color. After repeated dilatations we find, later on, a cicatrix generally situated upon the inferior wall, having a dry surface and a star-like appearance. The neighboring mucous membrane seems dried out and faded.

At times we find difficulty in dilating the canal. It is then that the urethral cicatrices extend into the periurethral muscles and the neighboring aponeuroses. However, even the strictures of this kind do not long resist treatment. The *cure* of forms showing hard infiltration follows a course identical with that which we have described for the forms of anterior urethritis of the first degree, the color and the normal folds reappear at the same time that the membrane again takes on a brighter appearance. The cure is generally rapid; it lags at times a little in the region of the verumontanum, especially when the latter is decidedly infiltrated. But once affected, it never again takes on its normal appearance. These strictures, however, are not too rebellious to treatment, and are cured by absorption of the soft elements included in the fibrous masses; during the course of treatment recurrences take place readily, especially after excesses of all kinds.

Clinical Details.—These hard infiltrations are formed

only, as a rule, after several years; they are always accompanied by very marked symptoms of irritation or of vesical weakness, of nervous and sexual troubles, impotence, pollutions, spermatorrhea, etc.

V. Appendix — Papillomatous Urethritis. — The papillomata that we find in the canal of the urethra do not necessarily follow a chronic urethritis, although this is usually the case. We see them, however, at times coming on in individuals who have never been affected with gonorrhea.

These papillomata are entirely similar to those which form upon the prepuce; they arise from an excessive proliferation of the mucosa at points where its papillæ become exposed after desquamation of the epithelium. In the most benign instances they appear at the period of soft infiltration or at the beginning of fibrous transformation; they are then very small, remain isolated, and protrude into the distal opening of the endoscope. It is often only necessary to pass this instrument to cause their disorganization and atrophy. They also disappear spontaneously at the end of a certain time. They may be encountered in every portion of the canal. There still exists a form of papilloma graver and more persistent. This is the larger *polypus* which, differing from the former, may obstruct the canal. It is often united in masses covered with a thick epithelium, and met with most often in the middle of the spongy portion. We find this formation in small numbers also behind the glans, in the bulbar region, and surrounding the verumontanum. Oberländer has seen them in one case to spread through the whole length of the urethra, and even invade the bladder.

The polypi may become necrotic and disappear spontaneously; but the production of these neoplasms does not cease, and is only ended by the cure of the lesion which gives it birth; for they develop, in general, upon the surface of hard, extremely resistant infiltrations, in which

we find granular and periglandular areas, and reticulate cicatrices forming veritable strictures. The existence of urethral papillomata is often not manifested by any symptom; at times there exists only a slight mucous secretion. Generally they are discovered by chance. At other times, on the contrary, they occasion intolerable itching, or else they make their presence known by a violent hemorrhage which comes on spontaneously.

These neoplasms are not resistant, and the best method of removing them consists in scraping the surface of the urethral mucous membrane by means of the blunt extremity of the endoscopic tube. They may also be removed by the curette, and the surface of implantation may be cauterized. The most important point, however, is the treatment of the lesion which has occasioned them.

PART THIRD

TREATMENT

THERE exists no disease whose treatment is, in general, so badly understood, and so insufficient as that of chronic urethritis. We have shown that this insufficiency of therapy results especially from the fact that diagnosis is not made in a sufficiently precise and complete manner.

Therefore, having dealt in detail with the various points of diagnosis, we shall not stop at the enumeration of all the methods of treatment which have been successively advocated only to again fall into disuse and become forgotten. We shall confine ourselves to presenting some indications for the methods most generally employed today. We shall present, at the same time, the treatment by means of Oberländer's dilators as they are employed by us.

CHAPTER IX

GENERAL TREATMENT

REGIMEN.—Regimen is of the first importance. We may say that the best directed treatment would surely fail in a patient given over to excesses of all kinds and who would refuse to be restricted by a sufficiently vigorous regimen. This should, however, not be excessively severe. It is useless to prescribe complete abstention from all irritating alimentation, from alcoholic drinks, from physical and moral fatigues, and from all sexual excitement, as we do in acute gonorrhea. We do not believe, once the disease has passed into the chronic period, that the use of beer or of wine, taken in moderate quantity, and especially at meal-time, can have an injurious influence on the urethral mucous membrane. We forbid absolutely the use of liquors. Without condemning the patient to complete repose, we forbid physical fatigues as well as horseback riding and the bicycle, at least so far as this interdiction is compatible with the patient's occupation and social exigencies.

It is impossible to formulate a fixed rule to cover these different points. Any given patient, in whom the least liberty in regimen calls forth an acute recurrence or an aggravation of symptoms should submit to a strict regimen. In others, on the contrary, the urethritis will be of a more torpid form and will scarcely react, no matter what may be the causes of irritation which could influence it. It rests, then, with the physician to discriminate as to these points according to the constitution of the patient; his habits, the moderation with which he would follow out any

liberties granted him; or, on the contrary, the abuse he might make of any latitude allowed.

As to the sexual act, it will evidently be better to suppress it in an absolute manner in order to withhold the patient from all danger of renewed contagion. This point is the more important, since the urethral mucous membrane, still diseased, offers a soil already prepared for all infectious processes, whether these be of gonorrhoic nature or simply the products of indifferent pyogenic micro-organisms.

[When the acute stage of gonorrhea has subsided and the process has lost its activity, either by the entire disappearance of the gonococci or by their latency in the deeper structures, the mucosa of the urethra is left in a very vulnerable condition. Janet aptly divided the stages of urethritis as follows: First, the stage of the invasion of gonococci; second, the anatomical and trophical lesions caused by the gonococci; and third, the secondary infections. Any of these three stages can be ascertained by the microscope, and each of them should be treated differently. The discharge in chronic gonorrhea does not always contain gonococci.

In a minority of cases we will find the discharge to contain streptococci only, with the addition of various diplococci (Fig. 4, *B*). These, however, differ in their size, staining, and decolorization qualities from the true gonococci. These micro-organisms, while non-pathogenic for a healthy urethra, which they inhabit with impunity, may assume violent properties in a urethra debilitated by the gonococci, or their toxins, or irritated by chemical, mechanical, or sexual influences. For instance, chronic constipation may cause the invasion of the bacterium coli into the urethra by way of the blood- and lymph-channels. Especially predisposed and receptive to these violences will be the urethra of individuals with gouty or scrofulous constitutions. This secondary infection causes a non-gonorrhoic baccilary discharge, and must be treated by antiseptic astrin-

gents (flushing with bichloride solution 1 in 20,000—1 in 10,000; or nitrate of silver 1 in 2,000—1 in 1,000).

In some even much rarer instances the discharge of chronic urethritis will be devoid of all micro-organisms, containing only mucus and epithelium imbedded in a network of fibrin (Fig. 4, *M* and *E.*, p. 51) In this case we speak only of a catarrhal aseptic discharge as a post-gonorrhoic manifestation. Here the simple astringents will effect a cure. If a mixed infection is present (gonococci and pus cocci), the anti-gonorrhoic remedies must first be applied and then the antiseptic astringents. Another, although rare, source of non-gonorrhoic discharge may have its cause in the presence of papular efflorescences of secondary syphilis in the urethra, or in intra-urethral chancres, or in some irregularly scattered glands whose excretory ducts open on the inner surface of the orificial lips (Diday), or in para- and periurethral ducts. In this latter instance with and without gonococci. It is therefore advisable to be on the lookout for such eventualities, especially as the para- and periurethral ducts may serve as secure hiding places for gonococci, causing reinfection of the urethra. They must be destroyed by the galvano-cautery.]

Unfortunately, since treatment is often of long duration, there is little chance that this interdiction be observed to the end. Besides noctural emissions, almost necessarily caused by this prolonged continence, have an equally bad effect when we make due allowance for the dangers of contagion. In some subjects, too, these nocturnal losses have a deplorable moral effect. Therefore it is better not to be absolute in the matter, and permit the patient to practice coitus with all possible moderation and, if it is possible, with the protection of a condom.

INTERNAL MEDICATION.—Internal medicines have not sufficient power of themselves to bring about cure. Still they oftentimes form useful adjuvants.

The balsams (copaiba, cubebs, santal oil, and turpen-

tine) are not without influence upon the intensity of the suppuration. When the latter is very abundant, notably at periods of exacerbation, they come in to diminish it and even at times dry up the discharge. Still they have too unfavorable an action upon the stomach and kidneys for their employment to be highly recommended. They have, besides, a slightly astringent action.

We employ the *balsam of copaiba* (Chopart potion), but because of its very disagreeable taste, it is better to prescribe it in capsules, of which the patient should take six to ten or fifteen in the twenty-four hours.

Cubebs is taken in capsules of from one to three grams three times a day. We may also combine copaiba with cubebs as in the following formula:

℞ Copaivæ, ...15.0
Cubebæ, ...20-30.0
Spt. Menth. pip. .....q. s. to form a paste

of which the patient takes in a wafer a piece the size of a large hazel-nut three times a day. [We prefer to have this mass divided into sixty gelatine capsules, of which three should be taken three times a day.]

Santal oil is perhaps the most highly recommended of the balsamics (1–3 grams daily.) It finds its field of usefulness largely in patients whose canal is very sensitive, and who stand local treatment badly. Most generally, however, all these drugs are prescribed "*ut aliquid fecisse videatur.*" Their action, when it really exists, is exhausted at the end of one or two weeks. [Santal oil is best given either in capsules, or to not fastidious patients in the form of an emulsion.

℞ Ol. Santali.....10.0
Ol. Cinnamomi.....gtt. x
Pulv. Gummi Arab. 4.0
Syr. Simpl 15.0
Aquæ ad..... .....65.0

M. D. S. Teaspoonful three times a day.]

Urinary antiseptics (salol, methylene blue, etc.) have scarcely any action in the chronic forms of gonorrhea, because the antiseptic power which they communicate to the urine is too feeble to reach the gonococci, which have generally penetrated into the substance of the tissues. They may be useful in acute recurrences. Undoubtedly because of the slightly bactericidal effects, and especially because they are absolutely non-irritant.

[To these so-called urinary antiseptics belong the salicylates in their several forms, as salicylate of soda, salipyrin, ol. gaultheriæ. They separate carbolic acid, and by thus inhibiting the growth of micro-organisms in the urine, render it less irritating to the inflamed surfaces of the bladder and urethra. They keep up at the same time an acid reaction, and so prevent ammoniacal decomposition. It is necessary, especially in subacute urethritis, to keep up an acid reaction to prevent cystitis. Finger has recently called attention to this fact and to the great mistake one makes by the routine administration of alkaline mineral waters in cases of urethro-cystitis complicating gonorrhea. Such a course will only add to the tendency of ammoniacal decomposition aided by an alkaline reaction of the urine.

The salicylates are undoubtedly of great value, but until recently salol has headed the list as an urinary antiseptic. But in some individuals it separates carbolic acid so freely as to render the urine an olive green color, setting up an irritation of the kidney epithelium and causing temporary albuminuria. In the introduction by Nicolaier of a preparation called *Urotropin*, we have a drug which has none of the drawbacks of the salicylates, and possesses a much more powerful germicidal, sterilizing, and antiseptic action. It renders ammoniacal urine acid, is almost a specific for phosphaturia, retards decomposition of residual urine, inhibits the growth of bacteria in the prostatic follicles, and proves of great service in bacteruria.

Urotropin acts by liberating in the urine, under the influence of uric acid, formaldehyde, which is inimical to all bacterial growth. The dose is five to ten grains three times a day in water. It is therefore advisable to administer a dose or two of the drug to such patients as are prone to develop urethral fever even when aseptic instrumentation has been practiced. It will surely supersede the time-honored dose of quinine recommended for that purpose. Urotropin is of exceptioual value in all the suppurative diseases of the genito-urinary tract. It is only in tubercular diseases that its influence has not proven so beneficial. We will make extensive use of it in subacute exacerbations of chronic posterior urethritis and urethro-cystitis, where instrumentation is absolutely contra-indicated. By arresting ammoniacal decomposition it will relieve the painful urinary tenesmus, and aid materially to shorten such incidents, after the decline of which proper treatment by washing and dilatation can again be resorted to.]

Nervines act as calming remedies to the nervous system; we use, by preference, those which have an action upon the genital sphere. They are often of great use when there is a posterior urethritis, when they rapidly calm painful and allay disagreeable symptoms. They are, therefore, useful adjuvants of the local treatment, whose disagreeable effects they help to mitigate. They include the *bromides*, the *narcotics*, opium and belladonna, which are of very great activity. Some *vegetable fluid extracts* may also act as calming remedies of moderate effect, capable of diminishing nervous excitability. Among the latter, we will cite *Kawa-Kawa*, and *Salix Nigra*. We prescribe the *fluid extract of Piper Methysticum* (*Kawa*) in dose of one and a half to four grams, two or three times a day, in a glass of water after meals; or, *fluid extract of the buds of Salix Nigra*, one or two teaspoonfuls in a glass of water three times a day at meal-time.

[In employing morphine hypodermically in urinary tenesmus, Finger points out that we should not go beyond one-third of a grain, as morphine in larger doses causes tenesmus. Mention may be made here of morphine and belladonna suppositories, and of the sedative influence of hyosciamus and cannabis.

℞ Extr. Hyosciami.
Extr. Cannabis Ind. aa., ...0.03
Sachari, ...0.06
M. D. tal. Dos. No. xii.
S. 3–4 powders t. i. d.

A large draught of flaxseed tea alternating with a decoction of foliæ uvæ ursi, has undoubtedly a very calming effect on the posterior urethra. It is by no means an obsolete medication, and is certainly worthy of a trial as an adjuvant in painful tenesmus.]

CHAPTER X

LOCAL TREATMENT

THE local is the only treatment upon which one can rely to bring about a cure of the lesions of chronic urethritis. It includes the employment of medicinal substances applied directly to the canal, and the purely mechanical treatment. These two methods may furthermore be combined.

METHODS.—To introduce a drug into the urethra we generally employ the method of injections.

I. *Injections.*—The following is the method of urethral injection as described by Diday: "Standing up or sitting upon the side of an arm-chair, the penis held erect, seize the syringe by the upper part of the barrel between the thumb and the right index, the index being placed upon the knob or within the ring of the piston; introduce the point from ten to twelve millimeters within the meatus, whose borders are pinched together by the thumb and index of the left hand, and draw this border to one side in such a way that it covers over the point of the syringe, to prevent a return flow of the liquid as the latter is injected. Now push the piston so as to empty the syringe in two or three seconds; then in withdrawing it press the meatus forcibly between the tips of the index and middle fingers of the right hand; wait a minute in this position; finally force the fluid backward by pressing the penis from above downward between the two fingers of the right hand, then between the two fingers of the left hand alternately, and successively carry the one behind the other, from the meatus to a point just in front of the scrotum, by a

movement analogous to that carried out by a man mounting a ladder in seizing alternately the rungs one after another."

We do not strongly advise this last maneuver, which can have no other result than to cause the fluids to flow into the posterior urethra where they should not penetrate. When the posterior urethra is affected, we prefer the method of deep washing or lavage. As to the instrument, we advise the use of a good glass syringe with a proper piston and a rounded tip which cannot wound the canal. This method of injection is most usually employed. It acts well in chronic urethritis with solutions which are not too energetic and which can, without inconvenience, be applied to the whole anterior urethra.

II. *Instillations.*—When we desire to employ more active solutions, it is no longer possible to send them by

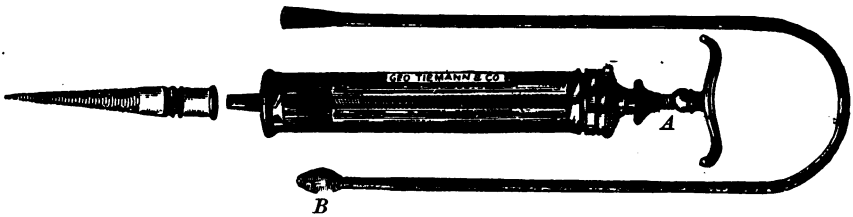


FIG. 23. GUYON'S INSTILLATION SYRINGE AND PERFORATED EXPLORER.

chance into the whole canal in considerable quantity. It is better to deposit the fluid at the diseased points, and we generally employ with this intention the method of instillation described by Guyon as follows:

"The instruments necessary are very simple. They include a graduated syringe (Fig. 23, *A*), to contain several grams of fluid, and a perforated, flexible, olive-tipped explorer made of gum-elastic (Fig. 23, *B*).

"The syringe should be furnished with a conical cannula having an external screw furrow; the perforation of the olive tip on the explorer should be centrally situated and

quite small. The piston of the syringe should be worked like that of the old Pravaz syringe, by successive turns of a screw and not by pressure. It is a mistake of instrument-makers to apply to the instillation syringe this useful modification of the piston which has been adopted for the hypodermic syringe. The syringe is filled with the solution desired, and then screwed fast to the extremity of the stem of the exploring bulb, to which it should fit closely.

"Before introducing the instrument into the canal it should be primed; the stem of the explorer holds a certain quantity of fluid. The syringe is to be filled exactly, so that, with each half turn of the screw, there should escape from the small opening in the bulb one drop of solution. If the connection between the explorer and the cannula is perfect, the liquid can escape only when the piston is put into motion; it is to secure this result that the cannula is conical and supplied on its exterior with a screw furrow."

With the method described by Guyon we can deposit a few drops of fluid in the bulbar region or in the posterior urethra. The olive tip permits one to distinctly recognize the moment the external sphincter is reached, and to know with precision whether the fluid is deposited beyond or upon this side of the sphincter. If we desire to make local applications with greater precision, we must employ the urethroscope, and touch the diseased point by means of a cotton-swab wound on an applicator and moistened with the desired solution.

[Instillation, that is the application of caustic solutions to a limited area, are used for both the anterior and posterior urethra. We are of the opinion that, as to the anterior urethra, it is wholly unnecessary. Anterior instillation is performed by introducing the instillator, of whatever description, down to the bulbar sinus, ejecting the remedy as the instrument is slowly withdrawn. The liquid will escape from the meatus, after it comes in contact, not only with the isolated patches, but with the whole surface

of the anterior mucosa. In our opinion this is nothing else but a retroinjection. Nothing is accomplished by anterior instillation which is not better done by the method of injection. The aim of touching a diseased spot only, although very rarely attained and well-nigh impossible, is not accomplished. The consensus of opinion as it now prevails is, not to use any instrument if we are able to gain our object without it. Injection by the hand syringe with a solution of the same strength, will not only act similarly, but will supersede anterior instillation in so far that under the well-graded pressure it distends the anterior urethra and allows the liquid to reach or even penetrate in the follicles. In order to localize with absolute certainty, we have to resort to applications through the urethroscope.

In making instillation to the membranous or prostatic portion of the urethra, we encounter somewhat different conditions. It is well known that the posterior urethra will bear the application of stronger solutions better than the anterior. This may be due to the absence of a greater number of glands and lacunæ or to the partly lesser surface which the posterior urethra offers to the influence of the remedy, or to the greater resistance of the epithelium in this region, or may perhaps be a combination of all these. The prostatic part is certainly endowed with a rich net-work of sensory nerves, and applications directly to it ought to

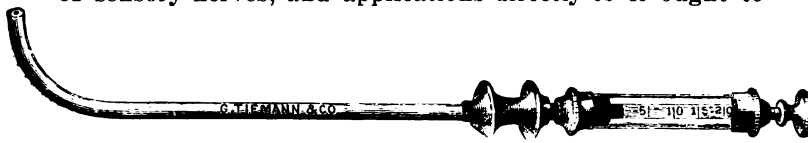


FIG. 24. ULTZMANN'S DROP-CATHETER.

irritate more than such to the membranous portion. However this may be, the posterior urethra, at least the pars nuda, is less receptive toward cauterizations than the anterior.

In performing these instillations we make use of differ-

ent instruments that will serve the same purpose with more or less aptitude. Guyon's instrument possesses the great advantage of permitting exact localization by means of its bulb, but we have to enlist the aid of the patient to hold it in place while working it. Ultzmann's drop-catheter (Fig. 24) consists of a silver catheter with a capillary lumen and a short curve. Its distal end bears a hard rubber capping,

FIG. 25. KEYES' DEEP URETHRAL SYRINGE.

into which fits an ordinary hypodermic syringe, the piston of which is graduated in minims. In Keyes' modification the instrument is solid in one piece (Fig. 25). The two latter instruments are easier of introduction and of handling, but being smooth they do not convey to the fingers that fine touch which Guyon's bulb instillator imparts. Friedlaender has recently devised a combination of Guyon's and Ultzmann's syringes by having the silver catheter end in a small bulb. We do not think any stiff-shafted bulb will answer so well as a bulb on a flexible elastic catheter.

Moreover, as we will localize lesions with the elastic bougie à boule before instillation is made, the selection between the two first-named instruments or their modifications will be more or less a matter of personal predilection. We do the work with the Ultzmann, as well as with the Keyes instruments. We have some predilection to the former, because we like the detachable syringe. The desired amount of a one to five per cent solution of nitrate of silver is drawn into the syringe, and the drop-catheter attached to it. The liquid is now propelled forward until the air is expelled, and the first drop appears on the visceral end of either the bulbous, elastic, or silver drop-catheter.

It is our custom now to withdraw the plunger a trifle, so as to aspirate this drop back into the catheter. The vacuum so created holds the column of liquid in an equilibrium, and prevents its escape while introducing the instrument through the anterior urethra. The catheter tip is now wiped with a piece of sterilized gauze, and the instrument lubricated with glycerin. As the catheter reaches the bulbous part of the canal, the outer end of the instrument, according to the rules of catheterization, is raised and gently pressed downward, making the tip inside pass the triangular ligament, and enter the membranous part. The long axis of the instrument is now 45° from the vertical. In order to reach the prostatic portion, a downward pressure of the shaft of about 10° more, or about three-quarters of an inch is necessary. If the application has been properly made, none of the injected fluid will return through the meatus. An imperative desire to urinate and, when the prostatic portion has been touched, to defecate, will soon be felt by the patient. We prefer *not* to have the patient void his entire urine prior to the instillation. This will expose the neck of the bladder readily enough to the influence of the injected fluid, while a little residual urine in the bladder will save its mucosa from the caustic effect of the silver. By the chemical change which the silver undergoes with the urine, non-irritating chloride of silver is formed, which will not irritate the mucosa of the bladder and that of the anterior urethra when the strong desire to urinate has set in.

There is one proviso we would like to emphasize. After instillation has been performed, there adheres to the catheter a drop or so of silver, which is necessarily brought in contact with the anterior urethra when the instrument is removed. It is our practice to again aspirate it into the catheter by slightly withdrawing the piston, in order to clear the tip of the instrument of adherent fluid. By this simple maneuver the anterior canal will not get

any of the silver unnecessarily when the instrument is removed.]

III. *Lavages.*—When we wish to employ considerable quantities of fluid, or desire to affect at the same time both portions of the urethra, we employ the method of lavage.

In order to proceed with deep washings without catheter, as described by Van den Abeele and recently brought into favor by Janet, we employ an Esmarch irrigator placed at about one or one and a half meters above the level of the canal. The tube of this irrigator is applied to the meatus in such a way as to entirely fill out the latter so that the liquid flows readily into the urethra. Janet has described a special tube which adapts itself admirably to this purpose. When the medicated fluid has filled and distended the anterior urethra, it forces the external sphincter and penetrates through the posterior urethra into the bladder. As soon as the latter contains a certain quantity of fluid, the patient urinates and so projects again the medicated liquid into the canal. At times the influx of fluid into the posterior urethra is accomplished only with much difficulty, but in this case we must urge the patient to relax the sphincter as though he would urinate. In this way the passage is facilitated. This procedure of irrigation is not without inconveniences. For this reason we prefer irrigation by means of a catheter. We may employ one of the many forms of catheters invented for this purpose; the models of Ultzmann and Oberländer [silver catheters with slit openings or with perforations] are those generally employed. It is still more simple to use the Nelaton catheter (numbers 12 to 15 Ch.).

When the eye of this catheter rests in the urethral canal, and the pressure by the syringe is not too excessive, the liquid will flow back along the walls of the catheter toward the meatus, if its eye lies in the anterior urethra; it will, on the contrary, flow toward the bladder, as soon

as the eye of the catheter has passed the external sphincter. If we desire to irrigate the anterior urethra alone, the catheter is to be introduced until the resistance offered by the sphincter indicates that it has come to the bottom of the bulbar region. We may then, by means of a syringe of appropriate dimensions, and under moderate pressure, inject an astringent solution or one of antiseptic or caustic nature, and thus irrigate the whole anterior portion of the canal, whose mucous membrane will be spread out by reason of the presence of the rubber tube in the canal. If the catheter passes beyond the sphincter, the liquid will, on the contrary, flow over the posterior urethra.

Finally, we may combine these two maneuvers, irrigate first the posterior region of the canal; then, withdrawing the catheter a few millimeters, act upon the anterior urethra. In drawing the prepuce forward beyond the meatus and holding it closed by means of pressure of two fingers, we can distend the balano-preputial region and irrigate it at the same time; this maneuvre is often one of great value.

Such are the proceedings most generally employed at the present time for introducing to the urethra such medicated solutions as we wish to use in acting upon the surface of the mucous membrane. There exist still other local methods of treatment: suppositories or melting bougies, antrophores, applications by means of *porte-caustiques*, etc., but they are scarcely capable of such general employment, and have no advantages over the methods which we have described.

MECHANICAL TREATMENT (the use of bougies and dilators).—This should also be described here as a method of local treatment. However, by reason of its great importance, we will devote a special chapter to its consideration. (See Chap. XIII).

[Since the treatment of chronic urethritis, besides instillations, mainly consists in flushings or irrigations and

in the introduction of instruments, a few notes on the use of the former may be ventured here. Since the revival by Janet of the irrigations in the treatment of acute gonorrheal urethritis, the somewhat promiscuous employment of irrigation has come into use. It is not our intention to dilate here on the merits of the method in acute urethritis, but risk a few remarks on irrigation and on the irrigation apparatus in the treatment of *chronic* gonorrheal urethritis. In conjunction with other observers, we are of the opinion that irrigation, or flushing or washing, as we may call copious injections, can be practiced more safely and simply with the large hand syringe. The most ingeniously constructed stop-cock of an irrigator will fail to carry to the hand that subtle sensation of resistance which the hand syringe will impart. Even in skilful hands the hydrostatic pressure by an irrigator, placed from three to five feet high, has caused, with rebellious compressors, edema, ischiuria, and hemorrhages. *Chalot* has observed in his clinic two cases of rupture of the bladder, after the use of the irrigator, one of which proved fatal. We had occasion to note a few cases, where, in spite of the greatest care exercised, urethro-cystitis and hemorrhage have occurred, coupled with painful tenesmus, and in some instances a paretic condition of the compressor muscle. Such and similar incidents have somewhat dampened our enthusiasm for the irrigator, to the use of which we were very partial. Since performing washings with the hand syringe, such untoward effects have ceased to occur.

This is easily explained by the fact that the hand syringe permits us to grade the propelling force of the injection with perfect accuracy. The thumb on the piston is *en rapport* with the patient, and imparts to it immediately that delicate sensation of resistance caused by the contraction of the compressor urethræ muscle when the fluid strikes it. The theory of washing the anterior urethra without catheter is based on this sudden impulse

which keeps the muscle closed. If we now stop injecting, and release the grasp on the meatus somewhat, while retaining the syringe in place, thus allowing the fluid to escape alongside the nozzle, then none will enter the posterior urethra. Thus the anterior urethra is cleansed. We have shown elsewhere the method of washing the posterior urethra. The maneuvers are the same as recommended by Janet. In using the hand syringe we have found that the relaxation of the compressor is synchronous with the *height* of expiration. It is best to push the piston cautiously forward at *this moment.*

Some observers are in the habit of using the hand syringe with preference, but attach a soft catheter to it for the purpose of dilating the urethra when flushing it. This is unnecessary. In anterior irrigation the fluid will balloon up the urethra, and spread out all its folds sufficiently by reason of the hydrostatic pressure, augmented by the counter-pressure of the contracting compressor muscle. In irrigating the posterior urethra with the hand syringe, a little experience will enable one to cause the fluid to enter the bladder without a catheter by observing the rules before mentioned. We should avoid, whenever possible, inserting instruments, even when asepsis is practiced studiously.

Generally speaking, with some exceptions, most forms of chronic urethritis will permit this method of washing without catheter. It is held that stronger solutions should not be applied to the canal in its entirety, touching diseased as well as healthy spots. While this is true of very concentrated solutions of nitrate of silver (one to five per cent), or sulphate of copper (one to fifteen per cent), when used as instillations, it is perfectly permissible to use for washing of the entire canal solutions of nitrate of silver in the strength of from 1 in 4,000 to 1 in 1,000. In fact this is often done by all those who are using the method of Diday, which consists in introducing a catheter into the posterior urethra, for irrigation, and then by

slowly withdrawing it to allow the fluid to escape through the anterior.

We will therefore use washings with the hand syringe in chronic anterior urethritis of a diffuse character, when the first urine is cloudy, or in diffuse urethritis, anterior and posterior, with both portions cloudy; or when the bladder is involved in connection with an anterior and posterior urethritis. Of course we will first employ the necessary two- three- and five-glass tests, preceded by washings of the canal to determine the location. Even those localized stages of chronic urethritis, where threads are abundant in a clear first or second urine, will be benefited by flushing with solutions of medium strength. In these latter cases, however, when threads appear with some constancy in spite of flushing, and the bougie à boule or the urethrometer has revealed spots where pain is felt, and the dilatability of the canal is impaired, we will have recourse to topical applications. We will then touch those spots with a mounted cotton-carrier through the urethroscope, when situated in the anterior, or use instillations (Ultzmann's "etchings") when in the posterior urethra. In those cases of posterior urethritis known as urethrocystitis, popularly called inflammation of the neck of the bladder, without involvement of the anterior canal, washings performed after Diday's method might prove preferable. Here the compressor may yield more easily to the catheter than to the pressure of the injection fluid. Here again the superiority of the hand syringe will show itself.

The hand syringe we use (Fig. 5, p. 57), is the one originally known as the Janet-Frank syringe. Its plunger consists of an inflatable rubber ring, or of several rubber disks, controlled by a screw connected with the piston-rod, which governs its expansion. The syringe has a capacity of 150 grams (five ounces) and is perfectly sterilizable. An olive-shaped nozzle (Fig. 5, p. 57) of soft rubber is put on the tip of it. This nozzle by reason of

its shape fits perfectly into the meatus. Such nozzles can be boiled or kept in a bichloride solution, 1 in 1,000. Each patient must have a separate one for himself. They are best kept in envelopes with the name of the patient thereon. We will dwell upon this point in a separate chapter.

As to the other details, they are almost identical with those when using the irrigator. The patient, after dropping his trousers below the knee, sits on a chair well toward the edge, leaning his shoulders against the back of it, his legs well spread and holding a basin between them. The physician stands on the right side of the patient, grasping the penis with his left hand. We claim that the hand syringe, besides the advantages mentioned before, possesses the additional advantage of simplicity and easiness in handling. Even the head of the celebrated French school of genito-urinary diseases, *Guyon*, where Janet expounded his irrigation treatment, calls the hand syringe an "instrument de précision."]

TOPICAL REMEDIES.—We can divide the class of remedies employed topically in the urethra into three classes: Astringents, caustics, and antiseptics. We shall briefly pass in review the chief ones among them, and point out their properties and general indications for their use. The choice which we will make will often depend upon the personal preferences of the practitioner, and upon the experience he has had with the various methods.

I. *Astringents.*—Astringents are certainly the products most universally employed. They comprise a considerable number of remedies from the vegetable as well as the mineral kingdom; from rose-water to sulphate of copper. They are generally employed as simple injections, but rarely as instillations. They have also been advised in the form of lavages. They have also served under other forms: dry powders distributed by means of a small tube to the supposed point of disease; pomades with which the sounds

are smeared, and thus introduced into the urethra; gelatin bougies melting in the canal under the influence of the body's heat, etc.

The *sulphate of zinc* is the prototype of astringents. In appropriate doses it gives excellent results. A one per cent solution is used two or three times a day. The acetate of zinc and the permanganate of zinc are employed in about the same strength and have the same action.

The *acetate of lead* is likewise prescribed. Generally their action is combined. Ricord's injection is an example:

℞ Zinci Sulphat..... 1.0
Plumbi Subacetat..... 2.0
Tinct. Catechu
Tinct. Opii ..... aa 4.0
Aq. Rosæ (or aq. fontis) 200.0

The sulphate of copper is employed in weaker solution (1 in 1,000). It is more caustic than the preceding.

[The use of any of these remedies at the proper time would be of great benefit to the patient, and a source of satisfaction to the physician. But we must confess that hitherto the indications for their employment have been so vague that it borders almost on intuition to choose the right one. We are, therefore, indebted to Finger, who quite recently expounded the use of nitrate of silver and sulphate of copper in chronic gonorrheal urethritis. For the recent superficial lesions, because only such are amenable to injections or instillations, he recommends the nitrate of silver; for older ones, the sulphate of copper. He draws a happy parallel with the treatment of trachoma of the conjunctiva. There the catarrhal symptoms are combated with silver, while the older processes are attacked with the sulphate of copper in substance. The same indications hold good for chronic urethritis, with this modification: In recent cases of chronic urethritis, where gonocci are yet present, nitrate of silver should be employed; in inveterate

cases, where no gonococci are present in the filaments, the sulphate of copper will prove effective. The nitrate of silver in one-half to five per cent, the sulphate of copper in five to ten per cent solutions.

It is best to begin with the milder percentages in order to test the reaction of the urethra. If stronger solutions are well borne, we will employ a glycerin solution of them instead of an aqueous one. The glycerin possesses great affinity for moisture, and will imbibe deeper than a watery vehicle. Finger recommends also the use of a lanolin salve to be used through Tommasoli's salve syringe.

℞ Lanolini..... 95.0
Olli. oliv..... 5.0
Argenti. nitr.
or cupri. sulphatis..... { 0.5, 1.0, to 5.0
{ 2.0, 5.0, to 20.0

In this vehicle the drug adheres very closely to the mucosa.]

The action of astringents seems to be as follows: They harden the superficial layers of the epithelium, and thus form a more resistant covering, underneath which a healthy epithelium may develop. Thus they are especially useful in mucous catarrh, whether the latter exists alone or accompanied by other urethral lesions. Their effect is then marked by a rapid diminution and at times by a complete disappearance of the purulent discharge. They may also, possibly, penetrate into the glandular cavities, and have an analogous action upon their epithelium. But they are naturally without action upon the deep infiltration, especially when the latter have passed into the fibrous state.

[By mucous aseptic catarrh is meant that rare form of catarrhal discharge from the urethra not caused by gonococci or other pyogenic bacteria. This, mostly scanty, discharge consists of mucus and some epithelium. It is called, therefore, an aseptic discharge. It can be met with

frequently as a post-gonorrheal secretion when the gonococci have vanished. It is here that the astringents prove most useful—zinci-sulphocarbolici, one-half to one per cent, for instance. In this case we may apply injections in form of suspensions. In Ricord's mixture soluble *zincum aceticum* is formed, while the insoluble plumbum sulphuricum precipitates on the surface of the mucous membrane. A still better formula is:

℞ Bismuth..... 5.0
Aquæ, or Glycerin..... 180.0
M. To be well shaken.

This should be injected before retiring. The bismuth will precipitate, and has a chance to remain in contact with the mucosa for several hours. It acts mechanically, and by being solved out slowly it thus exerts an astringent and slightly caustic influence, which restores slight lesions of the mucosa rapidly.

The reflex contraction of the vessels in the mucosa under the influence of an astringent, causes a cessation of the diapedesis of leucocytes. The consequence is a diminished secretion. We know of no valid reason why we should expect even the slightest action from them on infiltrations. Applied in weak solutions, they will, in addition, lessen the hyperemia, an action we are wont to call anti-catarrhal. In stronger solutions they will exert a caustic action of a lower grade, especially when the sluggishness of the process needs an alterative.]

II. *Caustics* are the topical applications employed in the treatment of chronic gonorrheal urethritis. Caustics are the most energetic, and give the best results. But we must know how to employ them properly and not in excessive dosage.

The prototype of caustics is the *nitrate of silver*. It is generally employed as instillation or lavage.

The instillation of nitrate of silver in strength varying

from 1 in 200 to 1 in 50, and even 1 in 30 have been especially recommended by Guyon. The method described by this author, and which has been widely used, gives in many cases good results. It is almost never necessary to exceed a strength of one per cent. We use nitrate of silver also in lavages (0.25 to 1 in 1000). These lavages have the decided advantage over instillations of greater concentration, of being less painful. Therefore they are highly recommended in the treatment of posterior urethritis. We also employ them in the treatment of anterior urethritis at the same time when mechanical treatment of the latter is indicated.

We can assure ourselves of the effect of nitrate of silver injections by means of an urethroscopic inspection of the canal a short time after the injection.

We note in this way that the nitrate of silver has produced upon the surface of the mucous membrane an escharotic effect. After a lavage by means of a solution of 1 in 1000, the membrane takes on a quite uniform grayish white color, spread over the whole extent of the canal. In stronger solution (instillations of one per cent) the color is still more marked and, furthermore, the membrane seems harsh and as though starched. At the end of twenty-four hours the normal color returns in plaques, then the grayish aspect disappears rapidly, the summit of the folds of the mucous membrane keeping the grayish color the longest.

This elimination of the eschar is naturally accompanied by a suppuration whose abundance is increased according to the concentration of the solution employed. Thus there runs from the canal a sort of creamy pus of yellowish white color.

Cauterizations with nitrate of silver have an energetic action on the superficial lesions, but they have naturally only a feeble effect upon the deeper ones. However, the abundant suppuration which they set up should have a

certain influence upon the parvicellular infiltrations, even when the latter have their seat in the deeper tissues. They may, even up to a certain point, provoke their absorption.

When the use of nitrate of silver has been too prolonged, the mucous membrane becomes penetrated by the reduced salts of silver and takes on a blackish gray color constituting *argyrosis*.

The use of very strong solutions (10 per cent) has been also advised in application to very limited areas by means of the instillator, or of the *porte caustique*, or under the control of the urethroscope. This procedure may be indicated when it is a question of destroying such lesions as granulations, or small polypi, etc. But we must be on our guard against too deep cauterization, capable of destroying the mucosa. Aside from the nitrate of silver, *chromic acid*, *sulphate of copper*, etc., have been used. They are perhaps less to be recommended. Employed in feeble solution, caustics act like astringents.

III. *Antiseptics*.—When the infectious nature of gonorrhea was recognized, the greatest hopes were built up on the action of antiseptics. These hopes have unfortunately been but feebly realized. If the action of bactericides can be very energetic in acute urethritis, when these remedies are judiciously employed, this is far from being the case in the chronic forms. Here the lesions of the mucosa are already in existence. the microörganism has penetrated into the substance of the tissues and into the glandular cavities, and we cannot count upon the action of an antiseptic to destroy it. Furthermore, employed in strong solution, the most energetic antiseptics have an irritating and destructive action; they cannot, therefore, be employed in concentrated form in the canal, and if used in weak solution they are inactive. Among them, the *nitrate of silver*, whose caustic action we have just studied, seems also to play the most energetic rôle as a bactericide. Thus it bears a double recommendation. *Corrosive subli-*

mate (1 in 20,000 to 1 in 10,000) has recently been advocated, as well as the *permanganate of potassium* (1 in 2,000 to 1 in 1,000). We use these two remedies as injection or in lavage. We can employ them with advantage, especially during acute recurrences which often accompany the treatment of chronic forms. They then act as slight caustics at the same time, and diminish or even arrest suppuration.

[We may be permitted to mention here that it was Dr. Wm. S. Halstead, of New York, who, we think, in 1884 suggested and first practiced the irrigation of the urethra (in acute gonorrhea) with a weak solution of bichloride of mercury. Already in 1880 Otis advocated its use in connection with Dr. Holbrook Curtis's advice of hot retro-injections by means of a fountain syringe. Bichloride irrigations have since been adopted in the treatment of chronic gonorrhea.]

When the exacerbation is very violent, it is best to employ still less irritating antiseptics such as resorcin (2 in 100), and sulpho-ichthyolate of ammonium (2 in 100), as injections (three or four times daily), or as lavage. Finally we may employ such combinations as:

℞ Zinci sulphatis
Aluminis
Acidi carbolici, aa.....0.30, 0.50
Aquæ..... .....125.

Or,

℞ Potassii permanganitis..... 1
Argenti nitritis 1
Aquæ 2,000

This last mixture should be prepared extemporaneously by taking a solution of permanganate (1 per cent), and a solution of nitrate of silver of the same strength. The two solutions are to be mixed together at the time of injection.

CHAPTER XI

*NOTES ON THE TREATMENT OF CHRONIC GONORRHEA**

[WE cannot help referring to the acute stage of gonorrhea in a volume dedicated to the chronic manifestations of the disease. Inasmuch as chronic gonorrhea is a sequel of the acute, we think that if the *etiologic* treatment of that stage were taken up as speedily as possible, it would diminish the number of cases of acute posterior urethritis and, incidentally, chronic urethritis. *Finger* notes in his latest publication (*Die moderne Therapie der Gonorrhea*, Vienna, 1900), the great advantage of such treatment. Those cases that have been treated with Protargol and Largin (one-quarter to one per cent) for the first week or ten days, followed by the use of antiseptic astringents like nitrate of silver or argentamine in 1 in 2,000 solutions, developed posterior urethritis only in very rare instances. While this complication will take place in seventy to eighty per cent of cases otherwise treated, we will find it only in forty per cent in cases treated with Protargol, and in thirty per cent treated with Largin. In the face of such statistics, and of our own experience, we are of the opinion that we possess in these salts a *prophylactic* remedy, which will limit the occurrence of chronic gonorrhea with its intractable complications.

In endeavoring to treat chronic gonorrheal urethritis according to the indications offered, we must try to determine, before all, the localization — whether anterior or posterior, and in the latter event, whether, and if so in what measure, the Cowper's glands, the prostate and seminal

*By the Editor.

vesicles are involved. It is somewhat surprising that chronic urethritis is mostly associated in the mind with a process invading the posterior urethra. This is a mistaken notion, for the anterior urethra is affected almost twice as often as the posterior. A favorite site is the bulbous region. This is probably due to a latency of the process in this region, causing a very scanty suppuration to appear. The case is then thought cured, while yet in need of treatment. The site of *predilection* for chronic posterior urethritis is the *prostatic* part. The different methods of localizing the process have been dwelt upon elsewhere, and concerning treatment scarcely anything new can be communicated. But mention must be made of the new silver-salts which play such an eminent rôle in the treatment of the acute stage. These are Argonin, Argentamin, Protargol, and Largin.

It is a well known fact that the new salts of silver do not change their chemical properties when in contact with the mucous membrane of the urethra. This chemical stability enables them to penetrate unchanged into the sub-epithelial layers, thus exerting their anti-parasitic powers in localities otherwise impermeable to other agents not possessing this virtue of penetration. The latest preparation of silver which promises these properties is the Protargol, introduced by Neisser. It occurs as a yellowish fine powder, readily soluble in cold, as well as in hot water, by agitation. It is a chemical combination of silver with a proteid, i. e., a silver abuminate. It differs from Argonin, which contains four and two-tenths per cent of nitrate of silver, in that its solution remains clear. It contains eight and three-tenths per cent of nitrate of silver and stands between its fellow compound, the Argentamin, which contains ten per cent of nitrate of silver. Argonin is the mildest, and Argentamin the strongest amongst them, and the most irritating. Its bactericidal and penetrating power is most marked. Indications for its use are, there-

fore, chronic cases, where an irritant is of great service, by provoking a subacute inflammation, starting up a secretion and, with it, a dislodgment of latent gonococci. Argonin is used in a one to four per cent, Argentamin in from a one-sixth to one per cent solution, in acute gonorrhea. When Protargol took the place of Argonin, it did so by virtue of its possessing, as Neisser maintains, greater penetrating power. It is evident that agents which do not enter into soluble combinations with the normal tissue-fluids, and are not precipitated by them, even when left in contact for any length of time, must have a great efficiency of action and power of penetration.

Lately Largin has been introduced through Finger and Pezzoli. It contains 11.5 per cent of silver in the form of a para-nuclein proteid, soluble in water to the extent of 10.5 per cent. Its bactericidal power is greater than that of Protargol, but it is not as penetrating as Argentamine, although more so than Protargol. It has a slightly alkaline reaction which makes its application somewhat irritating.

Finger recommends it in acute gonorrhea, after the acme of inflammation has passed, in the strength of one-fourth to one per cent solutions; in subacute posterior urethritis, as irrigation or instillation, in one-half to two per cent solutions. We have found it somewhat irritating. Among these silver-proteid salts, mostly Protargol and Argentamine are used in chronic gonorrhea. Finger, who gives to Protargol the first place in acute gonorrhea, discourages its use in the chronic form. Desnos and Nogues think it of greater value in chronic than in acute gonorrhea. The first-named author uses it in five to fifteen per cent solutions, while Chettwood,* in sharing the same opinion, believes it very useful for posterior urethral instillation in solutions of from five to forty per cent, especially

*_Venereal Diseases, their Complications and Sequelæ_, by Edward L. Keyes and Charles H. Chettwood, New York. William Wood & Co., 1900.

when the mucosa alone is affected; or as an adjuvant to the permanganate irrigations when the deeper structures are involved; also in chronic prostatitis, where it influences beneficially the surface inflammation.

We regret the inability to entirely concur in this view. Protargol will exert some influence on a mucosa in the state of chronic inflammation; but it can do this only by the very limited astringent power it possesses, if astringent properties it has at all. The lesions of chronic urethritis are circumscribed spots which persist after the acute diffuse process has run its course. These lesions may sometimes not extend beyond the mucosa, producing erosions and granulations, or they may in other cases involve the submucous and adjacent tissues, causing periurethritis and cavernitis in the anterior, or prostatitis when the posterior urethra is affected. Lesions like these need a powerful astringent like nitrate of silver or sulphate of copper, in order to be influenced. Protargol is mainly antiseptic and bactericidal, as is Largin; the action of both being enhanced by virtue of their unexcelled penetrating power. As they do not form insoluble combinations of chloride of silver, they are not precipitated and, consequently, do not bar their own way to the deeper structures. This fact alone explains their efficacy in acute gonorrhea. Here the gonococci, after invading the urethra, traverse the epithelium and gain entrance to the superficial layer of the subepithelial tissue infesting the lacunæ and Littre's glands.

Finger calls this the first or purulent stage, because the secretion consists mainly of pus-cells carrying gonococci. They and their toxins cause a reactive inflammation of the mucous membrane, immigration of polynuclear leucocytes and of pus-serum through the permeable walls of the enlarged and inflamed vessels. He further points out, in his graphic way, that the gonococci bent on invading the deeper structures create their own enemies, the pus-corpuscles. As these emerge from the depth to the

surface, the gonococci, in their downward journey, attack and invade them. Laden with gonococci, the leucocytes reach the surface and appear as purulent discharge. They actually float out the gonococci. The discharge, therefore, is Nature's endeavor to rid itself of the gonococcus. In this connection we have expressed elsewhere (*New York Medical Monatschrift*, February, 1899, p. 54) some views which have recently been brought out that are founded on this process of elimination by Nature's power.

It may seem somewhat reactionary, but certainly a very original view of Bloch (Berlin), when he maintains that it is unnecessary for us to strive to eliminate the gonococci.

We should look upon the inflammation as Nature's reaction, which should not be interfered with. We should not destroy the carriers of infection, because they generate substances which serve curative purposes. But recently we were taught to attribute to the leucocytes an inherent curative power tending towards self-limitation of infectious diseases. In being devoured by the microbes (phagocytosis), which cause their augmented appearance, they serve as destroyers and eliminators. It is not yet definitely settled whether this is an active performance of the leucocytes, as Metschnikoff thinks it to be. In the mistaken idea of increasing their numbers in the system and to fortify its resistance, speculative pharmacy has devised the administration of nucleines and nucloalbumins.

Furthermore, it is significant in this connection to note the view of Drobny in Charkoff, and others, that the course of gonorrhea is dependent upon whether the gonococci are contained within the leucocytes or are outside of them. Treatment is alleged to be more promising when they are intracellular; when they are found outside of the cells, treatment should by no means be instituted. In this latter event it is held that the gonococci or their toxins have somehow impaired the power of the leucocytes to absorb or of being absorbed (failing phagocytosis).

We think it certainly worthy of consideration to dwell for a moment upon the manner in which other self-limited infectious diseases end in recovery. In typhoid, for instance, it is alleged, that the causative microbe generates, as they all do, products of its metabolism. We may call them toxins or whatever else. These waste products of microbial life are in turn deleterious to their generators. Within a limited time, in our example, at the end of the fourth week, in cases which recover, the accumulated microbial waste will make the soil—the blood, which at the same time has elaborated antagonizing substances—uninhabitable to further microbic life. The typhoid bacillus has perished by its own toxins.

Finger states, in his recent publication, that gonorrhea is capable of spontaneous recovery, and that he has seen many cases get well in clinical practice under bed-rest and diet. This means that Nature's reparatory endeavors were sufficient to accomplish a cure. But since gonorrhea will rarely be treated under hospital restraint, and the average ambulatory patient is exposed to all sorts of noxious influences, we must resort to therapy in order to hasten matters. Finger recommends for the acute, purulent stage only antiseptics, such as Protargol and Largin; for the second, or muco-purulent stage, remedies which are bactericidal and astringent, such as Argentemin and nitrate of silver (0.05—0.1:200.0), especially when the threads have diminished and the subacute stage has set in. For chronic gonorrhea, in order to combat the superficial infiltrations, nitrate of silver for the more recent affections, and sulphate of copper for the older lesions, as washings in diluted, and instillations in concentrated, solutions. For the deeper infiltrations mechanical means.

After this, we hope pardonable, excursion, we return to the use of Protargol in chronic gonorrhea. Here it is that the use of astringents are indicated. In the acute stage the use of astringents was absolutely contra-indicated.

They cause a reflex contraction of the blood-vessels of the mucosa, and by so retarding the extravasation of pus-corpuscles and pus-serum, they prevent the reactive inflammation which floats out the gonococcus. But in chronic gonorrhea the case is different; here the gonococcus exists in the deeper structures and in lesser numbers, and is probably attenuated in its virulency. The mucosa has become tolerant to its presence. In consequence of this latency and its enfeebled condition, it does not set up irritation enough to cause a discharge sufficient to carry this out. The gonococcus will therefore lie in the depth of the lacunæ or Lattre's glands, or deeper yet in the connective tissue and cavernous bodies, or in the accessory genital glands, where it may have penetrated while the gonorrhea was in the acute stage. But its presence will, nevertheless, cause lesions of the mucosa in the form of erosions, granulations, and fissures.

These superficial processes will be influenced in a most beneficial and curative way by the antiseptic astringents, such as nitrate of silver and sulphate of copper, in irrigations or instillation. Again, the continued presence of the gonococcus and its toxins will cause structural changes in the form of connective-tissue hyperplasia, causing peri-urethral infiltration with gradual impairment of the dilatibility of the urethra. Thus the beginning of a stricture is established. When such deep structural changes have once taken place, no form of injection will be of any use, and we must resort to mechanical means, such as bougies and sounds. Generally speaking, the lesions of chronic gonorrhea will be treated by washings of nitrate of silver, or by instillation of nitrate of silver or sulphate of copper accordingly, and by sounds, especially when these lesions persist, or when peri-urethral infiltrations have established themselves.

For applications to localized spots the urethroscope will prove indispensable. When chronic prostatitis and sem-

inal vesiculitis are present, massage of these glands must be exercised. The use of the silver albuminate salts in chronic gonorrhea is only of secondary importance. But we recommend them in subacute exacerbations, brought about by various indiscretions of the patients, as adjuvants. Here, usually, a greater sensitiveness of the urethra prevails, and a flushing with a one-half to one per cent solution of Protargol will prove serviceable. In these chronic cases, therefore, we are in need of an astringent of caustic properties which the Protargol does not possess, but the nitrate of silver does.]

CHAPTER XII

*NOTES ON URETHRAL ASEPSIS**

[ASEPTIC methods are now employed in all branches of surgery. It is an outcome of the antiseptic method inaugurated by Lister, and means prevention of fermentation and putrefaction. When one uses such means as to make his instruments, hands, and field of operation sterile, i. e., free from microbes, he is understood to work aseptically. Having in this way succeeded in shutting out the microbes, there is then hardly any more need to use the germicidal chemical agents called antiseptics. Furthermore, we know that the urethra, with its delicate lining membrane, is apt to suffer in its integrity by the use of even very weak antiseptic solutions. Instead of preventing the development of microörganisms, such irritating solutions will, by destroying the epithelium, open an avenue of entrance to all kinds of microbes. It is therefore of the greatest importance to perform all instrumentations of the urethra with surgical cleanliness; that is, in an aseptic and non-irritating way. While this is true of all branches of surgery, and is vividly and typically carried out by the general practitioner, especially in his obstetric practice, there is a great deal of deficiency of this method when the urethra is the object of treatment. Happily times have passed when the practitioner carried his catheter, a well-worn and dilapidated looking affair, in his coat pocket, using his saliva to lubricate it, after having cleaned it with his handkerchief. But even the otherwise progressive man will very often content himself with doing justice to his aseptic conscience by im-

*By the Editor.

mersing his catheter in a doubtful looking bowl of hot water, using the dust-laden family vaselin jar, and anointing the instrument with his undisinfected fingers.

The eminent importance of aseptic catheterism has only been recognized in the last few years. Guyon, Alberran, Kuttner, Posner, Frank and others have shown us that unclean catheterism is by far the most frequent source of urethral infection. The whole success of a cure depends upon the use of instrumental and urethral asepsis.

We do not think that it is possible to attain an absolute asepsis of the urethra in the same sense as the surgeon provides an aseptic field, and attacks it with aseptic instruments. The genito-urinary surgeon may avail himself of the later desideratum, but he cannot fulfil entirely the first want. The healthy urethra is the seat of a very multiform microbic flora; some not pathogenic, some pathogenic, and others becoming so under favorable circumstances. Since we cannot, by reason of the peculiar sensibility and vulnerability of the urethral mucosa, render it absolutely aseptic, we must strive to use weak antiseptics, such as will not cause any lesions of continuity. The asepsis of instruments is, therefore, the most vital point. Its painstaking use has in a certain way to cover the imperfect asepsis of the urethra itself.

In making an exploration of the urethra certain measures must be observed, which may be summed up as preliminary and actual steps.

Concerning the first we must make it a rule, before handling the parts to be treated, to wash our hands in hot water with soap and brush, afterward immersing them in an antiseptic solution of bichloride 1–1000. Small rectangular pieces of linen kept in a well-closed jar, and previously treated with a 1–1000 bichloride solution, should be used to grasp the penis with the left hand. This latter measure serves at the same time as a protection to the physician's fingers. As a first step in the right direction,

the meatus must now be disinfected by wiping it and the glans with cotton pledgets, soaked in a bichloride solution of 1–1000. As this solution, when left in contact too long with the tender skin of the glans and the sensitive mucous membrane of the urethral orifice, proves somewhat irritating, a five per cent solution of boric acid should be used afterward in the same way, also instilling a few drops of it into the orifice. Of course the patient has to void his urine before. The next step consists of disinfecting the urethra. There is a great difference of opinion whether the micro-örganisms which inhabit even the normal urethra are capable of infecting the bladder or the kidneys. It is certainly a good plan to irrigate the urethra with sterilized water or a four per cent boric acid solution before introducing the catheter or sound. But in our opinion it is not essentially necessary in cases where a non-infectious process is to be combated. It goes without saying, however, that flushing the urethra is of the utmost necessity when we have to deal with gonococcic or other microbial affections. Having thus rendered the parts surgically clean, we may now safely proceed to the second actual step of instrumentation. In this connection we have to take into consideration how to render our instruments aseptic. It would fall beyond the scope of these notes to dilate upon the value of different methods of sterilizing our instruments. Elastic instruments need another mode of procedure in this respect than metallic ones. As these short notes should serve only practical purposes, we will but mention that there are elaborate methods and costly appliances of fulfilling the most stringent rules of asepsis. But we will consider here only such appliances which can be had or improvised by every practitioner at a small cost, and serve the purpose in view just as well.

To render elastic catheters and bougies aseptic, steam is the most serviceable method, and guarantees absolute sterilization. Kuttner has devised a very suitable appara-

tus, Fig. 26, which carries the steam not only to the outer surface of the catheter, but through it also. It is certainly a very desirable one and, for the consulting room of the specialist, of great value. But we can use an ordinary fish

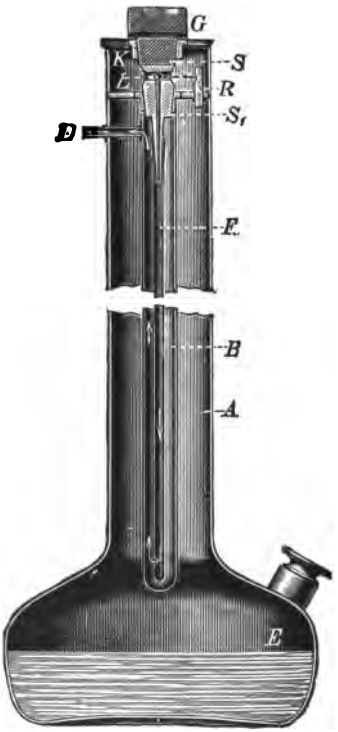


FIG. 26. KUTTNER'S STEAM-STERILIZER FOR CATHETERS.

The illustration shows only the boiler, which is partly filled with water *E*, and rests on a cylindrical stand with burner (not shown above). *R*, small tube for the egress of steam, through which the steam reaches compartment *K* and escapes through *G* and *B*. But when, as in the illustration, the stopper is inserted, both openings being closed, the steam can take its way only through the holes *L* into and through the catheter *F*. The catheter *F* is so suspended that the steam must pass through it from above downward, escaping through its eye, and passing along the outside escapes by means of outlet *D*.

kettle of smaller size, which will serve excellently this and several other purposes. In the lower compartment we boil the metallic instruments, and in the upper the elastic ones are placed.

Bacteriological investigations have proved that the common pathogenic bacteria are killed by immersion in boiling water or in steam for from two to five minutes. Even the most tenacious of them, the spores of the anthrax bacillus, dying in two to four minutes when so treated. By using one teaspoonful of carbonate of soda to the quart of water, rusting of the instruments is prevented. If we now allow fifteen minutes for boiling, steam enough will have developed, which, being under quite a tension, will circulate through the catheter lumen, rendering it sterile.

Posner, who entertains very doubtful views about our ability to absolutely render elastic instruments aseptic, recommends a yet simpler method of disinfection. Metallic instruments, as we know, are easily dealt with, and boiling them for two minutes, or a little over, completely sterilizes them. But with elastic instruments, like the Nelaton catheter and the woven ones, the matter is different. In an emergency, when the eventual damage to one's instruments is of no consequence, boiling of the elastic instruments will, of course, render them aseptic. They stand it a few times, but will soon lose their coating, become fissured, and useless. The nearest approach towards rendering them aseptic is, according to Posner, to put them in a five per cent solution of carbolic acid for, say, ten minutes, after having previously cleansed them thoroughly, or in a 1–1000 bichloride solution for a shorter time; then flush the catheters through with a syringe, using the same solutions and then with boiled water. To prevent reinfection the instruments should be wiped off with bichloride gauze and then lubricated with sterilized glycerin, or with boric glycerin of the following composition: Boric acid, 9 parts; glycerin, 63 parts; distilled water, 75 parts. Glycerin has the advantage, besides its germicidal power, of being soluble in water, and hence permitting an easier cleansing of the instruments. It is

best to use catheters, in which the space between the eye and the distal end—the so-called "dead space," which forms a pouch, where bacteria thrive and abound—is abolished and filled out. This has the other advantage of giving the catheter a firm end, rendering it easier dirigible.

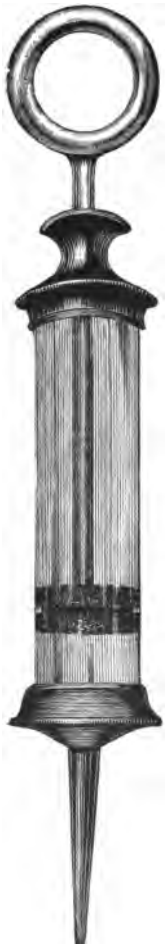


FIG. 27. SYRINGE, WITH GLASS BARREL AND HARD-RUBBER ADJUSTMENT, HOLDING 80 GRAMMES.

It may suffice to mention other methods of disinfection now in vogue. Besides the solutions already mentioned, some make use of chemicals in vapor form, sulphurous acid or mercurial vapor, which, however, hardly possess any disinfecting powers utilizable for our purpose. The most modern is formalin vapor. It is a useful antiseptic, but it has its disadvantages in catheter sterilization. It takes twenty-four and more hours to get the desired effect, the fumes of the drug corrode metallic instruments, and elastic ones soon become soft, sticky, and exfoliating. Besides, the coating of formalin vapor which settles on the surface of the instruments, being irritating to the mucous membrane of the urethra, must be washed off before introduction.

To sum up, the simplest, cheapest, and most effective method of rendering metallic urethral instruments aseptic is boiling them in a one per cent soda solution for not less than two minutes.

Elastic instruments will bear the steam very well, and may be rendered aseptic by using the household contrivance mentioned on p. 190.

To those who prefer a yet simpler method the use of the antiseptic solutions mentioned before will recommend itself.

It is, of course, understood that the handling of the instruments, after their having become aseptic, must be such as not to jeopardize the results attained. It is, therefore, a good plan to have a few towels, previously rendered aseptic by steaming, or by boiling them in a three per cent solution of carbolic acid, or in a 1–1000 of bichloride, to spread the instruments upon.

A few words concerning the accessory instruments: The irrigator should be of glass. When bichloride (very rarely) or nitrate of silver solutions are used for irrigations, they render it aseptic by their own germicidal powers. When other solutions, such as boric acid or the permanganate, are employed, which in themselves possess a weaker germicidal power, then it is advisable to boil or let a stream of hot water flow through it previously.

Syringes, if of the modern sterilizable pattern, are easily rendered aseptic by boiling. The compound ones, made of a glass barrel and hard rubber adjustment, cannot be boiled. (Fig. 27.) They are rendered aseptic by putting them into a 1–1000 bichloride solution for not less than fifteen minutes, and, if possible, for one hour, and drawing the barrel full of the same liquid. Before using they should be flushed through with boiling water.

It is obvious that for the use of bichloride and nitrate of silver solutions the glass-nozzled irrigator, or the hard rubber syringe with a soft rubber tip have to be employed.

When all these steps are carried out faithfully, and a certain methodical manner of employing them is adhered to, we have attained a degree of surgical asepsis which, if not ideal, is at least the very best we can do in the present state of our bacteriological knowledge. There are, we know, some intraneous, hematogenic sources of infection of the genito-urinary apparatus, but they are rare in comparison with the extraneous sources, and cause infection as a result of unclean catheterism. Aseptic cath-

eterization is not only a possibility, but a necessity. We must not only strive to perform it in an aseptic way, but we must regard it as a law, as an ironclad rule, the omission of which is on a par with criminal negligence, and as such to be avoided by every conscientious physician.]

CHAPTER XIII

MECHANICAL TREATMENT

INSTRUMENTS

I. BOUGIES — ANTROPHORES. — Whatever may be the action of the remedy employed, injections, instillations, and lavages are often insufficient to effect a cure. This treatment is, in a large number of instances, also inefficient. Thus we have been led empirically to employ a mechanical treatment. About twenty years ago elastic bougies began to be employed in rebellious cases, and their use has been persisted in to the present time. These bougies of large caliber were inserted into the urethra as far as the bladder, and left in place for from ten to twenty minutes. They were reintroduced daily or once a week, gradually increasing the caliber. This treatment, combined with astringent injections, has given and still gives good results. If we have to deal with soft infiltrations, and if the caliber of the meatus is of sufficient capacity, we can readily understand that it is possible by the use of large bougies to cause slight tears in the infiltrations, and thus to provoke their absorption.

Ultzmann, in cases of the firmer infiltrations, advised the use of increasing sizes of metallic sounds; these he introduced once or twice a week, increasing each time, if possible, the caliber by one number of the scale ($\frac{1}{3}$ mm.). At the same time he employed astringent and caustic injections. Unfortunately the diameter of the meatus scarcely permitted passing number 25 or 26, and the method found here its limits imposed by Nature. Burck-

hardt, to obviate these inconveniences, cut the meatus, and thus succeeded in passing number 30 or 32. The results which he obtained are naturally still better; but, unfortunately, this incision of the meatus and the introduction of these enormous sounds constituted quite a barbarous form of treatment. Furthermore, the bulb possessing normally a dilatability very much greater than that of the penile portion, left the problem not wholly solved, and the largest sounds became inadequate.

[The question of cutting the meatus has been and is yet ventilated. The experienced Otis advises to cut every meatus in cases where the orifice is found so small as to cause retention of discharge, or oppose the introduction of instruments for definite diagnosis and treatment. Ultzmann wants every meatus slit which does not admit at least a 27 F (= 18 American size), while Nitze entirely discards meatotomy. We have witnessed him introduce large lithotriptors through orifices of 10 and 12 F., under infiltration anesthesia, with ease.

The objections against meatotomy that it impairs the force of the stream and sexual capacity are not valid. While the opening should be made wide enough to admit sounds 28 to 30 F (18 to 20 American scale), we should avoid dividing the orifice to such an extent as to cause ectropium of the lips almost simulating balanic hypospadias (Chettwood). The little operation is performed under local cocaine or eucaine anesthesia. A narrow bistoury is introduced, and the cut made alongside the floor of the urethra. A pair of sharp scissors will answer the same purpose. A strip of iodoform gauze is then introduced in the urethra, which serves both the purpose of hæmostasis and of keeping the cleft open. Profuse hemorrhages are rare, and can be controlled by a circular bandage. The caliber should be maintained by the introduction of short conical sounds.]

Other authors have endeavored to employ bougies and

cauterizations simultaneously. For this purpose they introduced into the urethra sounds covered with nitrate of silver ointment (Unna, Casper, Flemmer). This procedure which, although it seemed rational, did not produce the results expected of it; nearly all of the ointment was left in the region of the meatus if sounds of sufficient caliber to act by dilatation were used; if, on the other hand, small-caliber sounds are used, the ointment may reach all parts of the urethra, but will be without action upon the hard and deep infiltrations of the mucous membrane. The same objections may be made against the antrophores advocated by certain writers. In the majority of cases, when the urethritis is obstinate, it is so because deep infiltrations exist in the mucosa. All measures, then, which we have just enumerated remain without sufficient results.

[The application of pressure in union with antiseptic astringents did not prove as effectual as it promised to be. Even Casper's grooved sounds could not entirely obviate the drawbacks pointed out before. The warmth of the urethra will solve out the ointment and expose the entire urethral mucous membrane to the irritating drug. It is, therefore, better to dissociate pressure from the drug application, and use sounds and instillation in their separate ways. We may use the sound and then instillation at one sitting. If there is great irritation present, it is better to perform each application on separate days.]

II. Dilators.—With the aim of reaching such lesions, Otis (New York) and Oberländer (Dresden) successively or simultaneously constructed their dilators. These dilators are absolutely different from the old divulsors employed by different authors in the cure of strictures. Following out the features aimed at in the construction of these instruments, their caliber was quite small; they were indeed intended for very tight strictures, in which dilatation was to act with great force; in this way the caliber of the canal was rapidly brought up to a point at

which free micturition was made possible. Once this result obtained, the process stopped there. Our dilatations at the present time go, as we know, much farther; thus the old style of instrument has become absolutely insufficient. Besides, the method formerly employed had decided inconveniences; the dilatation was violent and brusque; it was a veritable divulsion which caused deep tears in the tissue of the stricture, over which there flowed at once an infected urine. From this there arose numerous accidents, which explain the discredit into which the method has fallen. We shall see that the action of dilators of the present day is an entirely different matter. Besides, in covering them over with a rubber hood we are

FIG. 28. OBERLAENDER'S STRAIGHT DILATOR FOR ANTERIOR URETHRA.

protected against little accidents of a very disagreeable nature, such as pinching the membrane. Their antiseptic care is, moreover, rendered very easy.

The *Otis Dilator* (dilating urethrotome) is a dilator having two branches, separating by the action of a screw. The upper branch carries a small hidden knife, which can be made to spring forth at will in points where the dilatation meets with resistance, and where, consequently, mucous infiltrations exist. Nothing proves, unfortunately, that the blade does not penetrate healthy tissues of the urethral wall, and thus add an additional lesion to the older ones we are seeking to cure.

The *Dilators of Oberländer* (1887) are made on the Otis model. Oberländer and, afterward, Kollmann have since greatly improved these instruments, which are the only ones employed to-day. These dilators are composed essentially of two steel branches, applied one against the

other; when closed, they have the form of a metallic sound and a caliber corresponding to number 15 of the Charrière scale. These branches, by an arrangement of hinges and a screw, may be separated at will, the distance from each

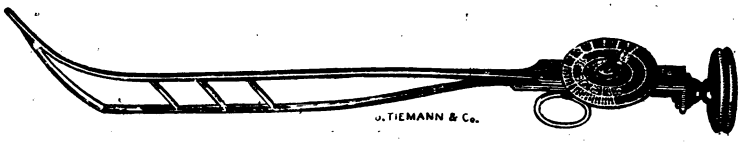


FIG. 29. OBERLAENDER'S CURVED DILATOR, MAINLY FOR DILATATION OF THE BULBOUS PORTION.

other is exactly measured by a dial near the handle of the instrument. In this way the caliber of the sound which it represents increases little by little over a certain extent of its length, according to the extent of dilatation which we wish to obtain at this point. The details are better given by the accompanying illustration of the instrument than by any description we might attempt. At the present day we employ the following instruments:

1. A short dilator (16 cent.), which is straight, and whose extremity is slightly curved to represent the form of the penile urethra, together with the beginning of the bulbar region (Fig. 28). When this instrument is opened

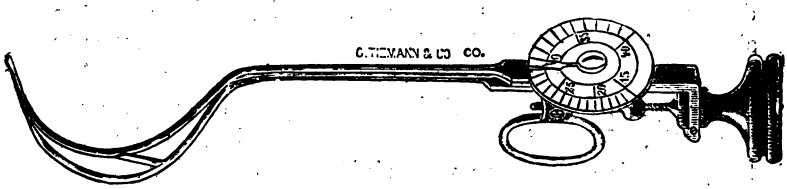


FIG. 30. OBERLAENDER'S BENIQUE-CURVE DILATOR.

its caliber corresponds to that of the canal; that is to say it is much wider at the bottom than at the part which corresponds with the meatus. We may, by introducing this instrument, dilate all parts of the anterior urethra as far as the bulb.

2. A longer dilator (21 cent.) with branches more parallel and with an extremity more curved, having the form of Ultzmann's sounds (Fig. 29). When the instrument is in place, the heel of the curve, the point where the dilatation is the most pronounced, rests exactly in the *cul-de-sac* of the bulb. The instrument is thus well suited for infiltrations in this region.

3. A dilator having the form of the Beniqué sound (Fig. 30) and dilating only in the part corresponding to the posterior urethra. It is employed only for this region.

Oberländer has constructed still other types of dilators. Those we have described are the most generally employed.

Kollmann has slightly modified these instruments in giving to them four branches, so as to exert a more uniform action upon the whole circumference of the urethra. He employs, notably, a straight dilator (Fig. 31) for the penile region, a curved dilator for the bulb (Fig. 32), and a Beniqué dilator (Fig. 33) for the posterior region. All of these instruments are constructed of excellent steel, that will not bend, so as to exert a uniform action and preserve exactly the form and the degree of distention which has been given them. The flexible branches of the old dilators gave way too readily at the points where the resistance in the urethral walls was the greatest; that is to say at the very points where scleroses existed; or, in other words, precisely where their action should be the most energetic. In the instruments of Oberländer, on the contrary, the branches are very rigid; the dilatation is produced by their passage and by a play of the joints, which increases still more the resistance. The dilators require to be kept carefully cleansed by reason of the delicacy of their function. It is necessary, every day after they have been in use, to expand the instrument completely and wipe it carefully by means of a dry cloth; the hinges are to be principally looked after, and care must be exercised

FIG. 31. KOLLMANN'S STRAIGHT ARTICULATED FOUR-BRANCHED DILATOR FOR THE ANTERIOR URETHRA.

FIG. 32. KOLLMANN'S CURVED ARTICULATED FOUR-BRANCHED DILATOR FOR THE POSTERIOR URETHRA. GUYON'S CURVE.

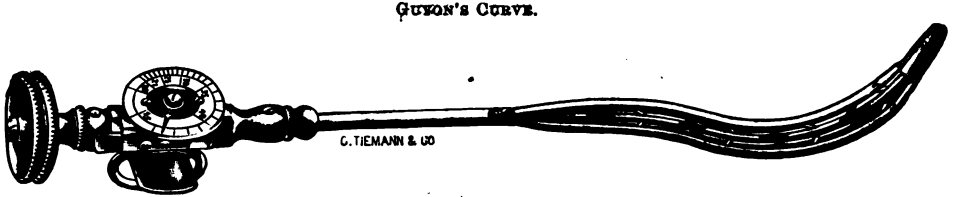


FIG. 33. KOLLMAN'S DOUBLE-CURVED ARTICULATED FOUR-BRANCHED DILATOR FOR THE POSTERIOR AND ANTERIOR URETHRA. GUYON'S CURVE.

not to allow them to become rusty. When the instrument is thus well rubbed, it is to be coated with a thin layer of petroleum by means of a small brush, and then wiped again, so as to remove all excess of fatty matter.

These details are not unnecessary, because the instrument, when well cared for, can be used for a long time without requiring any repairs, while it gets out of order at once if it is not properly looked after.

The rubber slip cover (Fig. 34), which one should never neglect to place over the instrument each time a dilatation is to be carried out, fills a double function; it prevents the mucous membrane from becoming pinched between the branches of the instrument when the latter is closed, and from being dragged upon when the instrument is withdrawn; in the second place it alone comes into contact with the walls of the urethra and, being capable of being kept aseptic, renders very great service from this point of view. After each dilatation we must at once remove the cap covering the dilator, clean it carefully, wash it in some antiseptic solution, boil it or sterilize it, as one may prefer, and keep it aseptic until it is to be used again.

[In order to combine dilatation with irrigation, without change of instruments, Kollmann, of Leipsic, has recently devised so-called irrigating dilators. Fig. 35 represents one for the anterior; Fig. 36 another for the posterior urethra. Lohnstein and Scharff had previously used instruments on this principle, but Kollmann improved them by making the dilating branches stronger and by rounding their edges, in order to avoid pinching of the mucous membrane when closed for withdrawal. The use of a rubber hood is therefore here unnecessary. Below the dial near the handle are two projecting nipples for the attachment of rubber tubes. Each leads to a tube enclosed in the hollow axis of the instrument. One tube opening within the first third of the instrument, the other through four little holes at the end of the axis, producing jets in a retrograde direc-

FIG. 34. RUBBER CASE COVER.

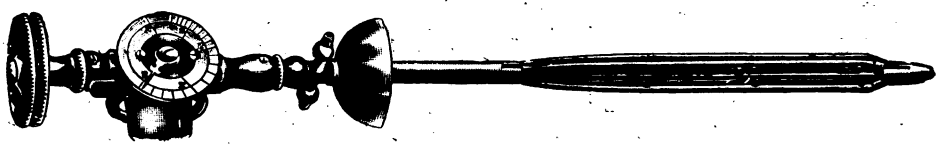


FIG. 35. KOLLMANN'S STRAIGHT ARTICULATED FOUR-BRANCHED IRRIGATING DILATOR FOR THE ANTERIOR URETHRA.

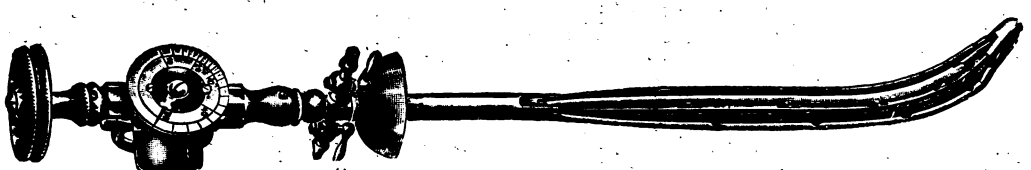


FIG. 36. KOLLMAN'S CURVED ARTICULATED FOUR-BRANCHED IRRIGATING DILATOR FOR THE ANTERIOR AND POSTERIOR URETHRA.

tion. The instrument is well lubricated with glycerin and, like all dilators, is introduced closed. When in place we commence dilatation, one or two millimeters at a time, as indicated by the hand on the dial. Irrigation with the large hand syringe is then made, first through one, then through the other rubber tube. The fluid used is a three per cent very warm boric solution, at 100 to 110° F. It seems that the heat of the injection exerts a softening and soothing effect on the infiltrations, which permits a higher grade of dilatation afterwards. Besides, the contents of plugged urethral glands or crypts are more easily floated out when the washing is performed under expansion. Eventually the necessary instillations are performed in the usual way, after removal of the instrument.

Kollmann's four-branched dilators have, when closed, a diameter of number 20 F. (13 American scale). Those of the irrigating dilators number 25 F. (17 American scale). The shaft above the dilating parts number 16 F. (10 American scale). In cases of congenital or acquired narrowness of the meatus, we will use short, conical, metallic sounds preparatory to the use of the dilators. Cutting of the meatus will, of course, be necessary, where the orifice does not admit a 16 F. without much discomfort. The advantages of these dilators consist, therefore, in enabling us to perform dilatation up to 30 and 40 F. (20 to 28 American scale), even in such urethras where the orifices would not admit higher numbers than 16 F. without painful distension. In using dilatation we must bear in mind that the *aim of dilatation* is different, according to whether we have to treat an established stricture or chronic gonorrheal infiltrations. In *stricture* we desire to attain restoration of the caliber of the canal by mechanical pressure and by the dynamic action of the bougie, sound, or dilator. In *chronic gonorrhea* our object is to influence the infiltrated tissues and promote absorption by the same means (pressure), but we also strive to empty glands and

their clogged ducts, the crypts and other follicular depressions containing pent-up material. The gradually distending branches of the dilators will squeeze them out more readily than metallic sounds with unchangeable diameter would do. Dilators possess, furthermore, the decided advantage of exercising gradual distension only on such parts of the urethra as are in need of it. They expand in a manner corresponding with the anatomical conditions. The anterior urethra is shaped like a cone, widest toward the sinus bulbi, and gradually narrowing toward the meatus. The bulbous portion is, therefore, the most dilatable, while those parts of the anterior urethra situated in front of the bulb are successively less dilatable. (Fig. 2, p. 11). The anterior dilator is therefore constructed in such a way as to distend the bulb most, and the other parts toward the meatus less. Its use is confined to the parts from the meatus to the bulb. The posterior dilators are also constructed on the same principle, with the greatest expansion toward the prostate and tapering toward the pendulous urethra. The posterior urethra, as we know, consists of the membranous and prostatic parts. If we wish to dilate the former, with the patient in a horizontal position, the shaft of the instrument must stand almost vertical. When the prostatic part is to be dilated the shaft must form an angle of 45° with the horizon. We never use a lubricant directly on the instrument, as merely dipping the dilator in talcum allows the rubber cover to be drawn over it. As a lubricant to this glycerin is used.

Irrigating dilators, which are used without rubber hoods and metallic sounds, are best drawn through the flame of an alcohol lamp to make them aseptic, or they may be boiled and sterilized. Kollmann has devised a steam sterilizer for this purpose, similar to his cystoscope sterilizer, which, though very convenient, is not absolutely indispensable. Fig. 37, with a slight modification in its funnel, can be used for dilators also. We prefer keeping them in a jar

filled with absolute alcohol. Before use they are wiped off with sterilized gauze. In being staunch advocates of the dilators, we do not think of discarding metallic sounds. A closed dilator of 16 or 25 F. is actually nothing else but

FIG. 37. KOLLMANN'S CYSTOCOPE STERILIZER.

a sound of the same caliber. The difference sets in when dilatation begins. Where the meatus takes a 26 F. (15 American), we will use bougies or metallic sounds up to that number. As higher numbers would not be admitted, we must of necessity use dilators, whose circumference when closed is 20 F. An advantage of dilators over sounds is that we do not need to change instruments when the next

higher number is desired. The main contra-indication for the use of both are the presence of gonococci, acute exacerbations, and the presence of complications. We are in the habit of washing the urethra with the large hand syringe after every instrumentation with a three per cent boric acid solution, or with permanganate, 1 in 4000; or with nitrate of silver, 1 in 2000, according to the indications present.]

III. General Rules of the Method of Dilatation. — *Operative Procedure.* — This is how we proceed in a seance of dilatation: It goes without saying that one should never use the least violence. We must also strive, in so far as it is possible, to avoid giving pain. Thus we may render the urethra non-sensitive from the start by applying cocaine (injection of four or five grains of a solution of cocaine or of eucaine, in strength of 1 in 30, during five or six minutes); the patient will carry out, for a few minutes, gentle stroking along the canal so as to distribute the injection throughout the whole urethra. The closed dilator will then be covered with borated glycerin [or talcum powder,] and ensheathed in its rubber covering, which should be smoothly applied and free from folds. This being done, the external surface of the rubber cap is smeared in its turn with glycerin or with neutral soap prepared after Guyon's formula.

[This is a soap-glycerin salve of the following composition:

℞ Pulveris saponis glycerini.
Aquæ aa..... .....30.0
Ac. Carbol cryst 1.0

This soap must be of neutral reaction because an excess of alkali would irritate the mucosa. To avoid this irritation Krauss has devised a lubricant, the basis of which is gum tragacanth.

℞ Gummi Tragacanthæ..... 2.50
Glycerini 10.0
Aq. Carbolis at. (3%).....90.0

The advantage of this salve lubricant is that it does not contain fat which corrodes the catheter by dissolving its varnish. Another reliable domestic preparation called "Lubrichondrin" is also very useful. The catheter, in our case the rubber hood, can readily be washed, as the ingredients are easily soluble in water, and the salve remains aseptic for an indefinite period. These rubber hoods or caps are best kept in sterilized test-tubes plugged with cotton, after having been boiled or put in bichloride solution, 1 in 1000.]

The instrument is then introduced in the same way as though it were a sound of the same form; once in place, the dilatation is begun by slowly turning the screw, which governs the separation of the branches. In this way a degree of dilatation is produced, which gives the patient a slight sensation of tension and pricking. A pause is made sufficiently long for this disagreeable sensation to disappear; the dilatation is then begun again until the feeling reappears. In this way the desired degree of stretching is reached. We shall see, later on, how this degree of dilatation is exactly determined for each case. The instrument is allowed to remain in place for a few minutes and, after having been unscrewed, it is gently withdrawn. The first dilatation in a patient requires a certain amount of caution. If we have to deal with a stricture in which we succeed in passing the dilator, entirely closed and covered with its sheath, corresponding to number 16 Charrière for the first time, we should not go beyond 18 or 20. But in the majority of cases the canal will have been previously examined by the urethroscope; it will then admit at least a number 23, and the first dilatation will go up to numbers 25 or 30, according to the pain complained of by the patient, and the importance of the lesions observed.

For the subsequent sittings, we should still observe with attention the sensations experienced by the patient. As soon as he feels pain we should pause; at the end of a

certain time, the pain having disappeared, we begin dilating again, and this will be continued up to the degree wished for. If the pain is severe and persistent, we should stop, whatever may be the number we have reached.

The seances are held on an average of every ten or fifteen days. Such are the general indications. We will study the detail of the method in the succeeding chapters. The advantages of this process of dilatation are evident. It is only necessary for one to have employed progressive dilatation by means of sounds in order to appreciate at once the difference on trying the dilators. The use of dilators permits one to localize, in a way, the mechanical action in the affected region, to measure accurately the force exerted, to graduate it at will without having constantly to introduce new instruments, and to spare the meatus, the most sensitive part, and the one most ill-treated by other methods. Besides, it offers all the necessary guarantees of perfect asepsis.

To be sure, it may happen that one will meet with disagreeable situations if the requisite dexterity and necessary experience have not been acquired, and especially if one does not govern himself *scrupulously by the rules of treatment*. But we will call attention to the fact that all surgical procedures are open to the same inconveniences, and that, besides, the use of bougies and sounds have provoked, and still do provoke, more accidents than dilators have ever done.

Contra-indications. — There exist some contra-indications to the use of these appliances. They can scarcely be employed except after the acute period of urethritis has come to an end, and especially when the complications, which have perhaps arisen, have subsided or else passed into the chronic form. It is especially so in cases of posterior urethritis. If this posterior urethritis has been accompanied by epididymitis, prostatitis, etc., the greatest caution will be necessary. The acute phenomena should then have

completely disappeared for at least a period of fifteen days before we can dream of resorting to dilatation.

The contra-indication is absolute if other affections exist upon which dilatation might have a dangerous action, and notably in the presence of urinary tuberculosis; in the latter case even when its existence is not absolutely certain.

Preliminary Precautions.—Certain precautions are indispensable before dilatation. Oberländer recommends that it should never be undertaken in the fasting state for fear of syncope. In very sensitive individuals we should gradually familiarize the canal with the contact of instruments, and abstain from all painful maneuvers during the early sittings. Once the operations have become familiar to the patient, we may act more energetically. We must also be careful to have the patient urinate immediately before operation, so that afterwards he can retain the urine as long as possible. He will thus avoid the pain which might accompany the first act of urination, when the time which has elapsed after the operation has not been sufficiently long. If we remember to warn the patient, this pain, which is, by the way, quite insignificant after two or three hours, presents scarcely any inconveniences.

Hemorrhages.—With these precautions, and if we act prudently, there is no fear that dilatation will be followed by accidents of any gravity. It happens quite often, however, that it brings about a slight hemorrhage. We know that the dilator must cause slight *tears* in the infiltrated tissues, which become the starting point of a process of resorption. These tears are generally subepithelial, and do not make their presence known by any symptom. But it may happen, in cases in which the infiltration is very hard and of long standing, that they spread out more than we would have wished, and give rise to a quite considerable hemorrhage. Scarcely is the dilator withdrawn from the canal before we see a flow of blood or a hemorrhage appear, which is very slight at this moment, and in-

creases materially after the first urination, so as to cause the patient great anxiety.

In general, the flow of blood, when not considerable, stops spontaneously in a few minutes. If it persists, or is abundant, we can arrest it immediately by exerting compression upon the urethra. The patient will, for example, compress the canal gently by seizing the penis in the hand; after a few minutes the bleeding stops. If it begins again after urination the same maneuver is to be repeated. We may also use a small linen bandage of one or two centimeters in width, which is rolled around the penis immediately behind the glans. This band is bound on tightly enough to arrest the bleeding. It does not prevent urination, and may be worn by the patient until the hemorrhage has ceased. In making a urethroscopic examination after a seance of dilatation, we often see the canal present small longitudinal fissures or tears of variable dimensions situated, by preference, on the inferior wall. These tears should be entirely cicatrized before dilatation is begun again, otherwise it will only tend to open them still more.

The discharge is generally *increased* after each operation. This is observed especially in the soft infiltration, in the transition forms passing into hard infiltration, and in the glandular forms; when the infiltration is very dense and constitutes what has been called soft strictures, this increase in the discharge is constant. When the dilatation has been overdone, a veritable acute recurrence with abundant purulent discharge may be produced; but this is the result of a faulty technique, which we must always strive to avoid.

We must be cautious when it is a question of a long-standing affection which still suppurates abundantly. There exists then, in fact, around the old fibrous infiltrations, very extensive foci of soft infiltration; dilatation is, in these cases, always followed by an abundant suppura-

tion, due to the purulent breaking down of the infiltration tissue. This symptom disappears at the end of eight to fifteen days, but we can not undertake new dilatations before having obtained the sought-for improvement, or at least before the discharge has come back to the condition it was in before. The situation, however, is gradually improved, and the subsequent dilatations no longer give rise to other than a feeble and gradually diminishing reaction.

Dilatation acts, on the contrary, in quite a different way in the dry and hard forms. The discharge, if any still exists, *disappears* after each seance, not to reappear for ten or fifteen days. At the same time the filaments, which are at first large and heavy, become smaller and smaller and gradually disappear. It is altogether exceptional after a seance of dilatation to have patients show signs of *urinary fever*. Such attacks are only encountered in run-down subjects or those whose upper urinary passages are affected. In such cases, however, the least manipulation in the urethra may occasion the same inconvenience, and we must take all possible precaution to avoid fever. The administration of antipyrin or of quinin beforehand, the use of saline purgatives, careful disinfection of the urethra, very complete cocainization, slow dilatation of short duration, followed by rest in bed for several hours.

[In patients where we have reason to expect febrile attacks after instrumentation, it is advisable to administer salol, 10 grains t. i. d., or better yet, urotropin, 8 grains t. i. d., as a preventive. In case of suppression of urine, besides urotropin, copious draughts of diuretic mineral water should be administered. It is a good plan to induce profuse perspiration to unburden the impaired kidney action. It is essential to wash the urethra with a four per cent boric solution before and after instrumentation.]

As the patient's condition improves, there will be a gradual diminution and disappearance of all febrile

tendency, but the greatest caution will nevertheless be always in order.

Mode of Action.—How does dilatation work, and what influence does it exert upon urethral lesions? To make a just estimate of this point we must proceed with a urethroscopic examination immediately after the operation. We perceive then small, longitudinal fissures, a few millimeters in length, covered with coagulated blood. These tears are situated wholly in the middle of the zones of infiltration, and by preference in the neighborhood of the diseased glands, whose excretory ducts they often traverse. They are never found in regions where the mucous membrane is normal. They are at times subepithelial, and extend into the mucosa. They cicatrize after a few days, and no further trace of them is found. From these fissures starts the process of resorption which should lead to a cure of the chronic lesions, and we can readily show that it is in their immediate neighborhood that the phenomena which mark the first stages of cure begin, and which we have described elsewhere.

IV. Special Rules of the Method of Dilatation. —Let us now take up, one by one, the various forms of chronic urethritis and its treatment.

Anterior Urethritis.—*Soft Infiltration.*—This form of chronic urethritis, usually encountered three or four months after the beginning of the infection, is that which is cured the most readily and the quickest. Here the nitrate of silver in washings (2 to 1 in 1,000) or in instillations (1 to 2 or 3 per cent) gives excellent results, and usually suffices to bring about complete cure. When the gonorrhea has spread to the posterior urethra and has there left traces, which often happens at this period, we must extend the silver washings (0.25 to 1 in 1,000) to this portion of the canal. Instillations in the posterior urethra (1 per cent) act more energetically perhaps, but are so painful that they should be avoided as much as possible.

We do not employ them. [We differ with the majority of the profession on this point.]

The astringents and antiseptics are also found useful. The permanganate of potassium is especially convenient for the destruction of gonococci, which are still found at this period, and whose persistence exposes to recurrences. It is very useful, and sometimes rapidly dries up suppuration. Boric acid, corrosive sublimate, and the sulphate of zinc may also find a field of application, as well as internal remedies. Some will be prescribed to diminish discharge (astringents); others to rapidly asepticize the canal and diminish the danger of contagion (antiseptics). In general, we often employ the *sulphate of zinc* or the *permanganate of potassium* according to the case in question, the patient making for himself two or three injections daily. These injections are carried out at the same time as the nitrate of silver lavages, of which we have just spoken.

[We had occasion to mention that we regard instillation as especially adapted for the posterior urethra, and that in our experience the posterior urethra bears concentrated astringents very well. As to washings, boric acid in four per cent solutions will prove especially serviceable when used hot (104°); corrosive sublimate is rather rarely used, as it causes irritation in some urethras, even in a dilution of 1 in 10,000. The permanganate in solutions of 1 in 4,000 to 1 in 6,000 we have found very useful in cases of persistent discharge. In weaker solutions, 1 in 6,000, it will allay the effects of a previous overstimulating treatment. It is a sound principle to conform our treatment to the condition of the mucosa, and to stop local treatment entirely for a while when irritative symptoms have set in. The salicylates or urotropin, with or without opiates, will tide us over until such subacute exacerbations have ceased. It will be then that the sedative action of thallin in solutions of three to twelve per cent, warmly recom-

mended by Chettwood, will act beneficially, and at the same time preparatory to a more active treatment. The quantity injected should be from a half to two drams. It should be kept in dark bottles. Inasmuch as a subacute exacerbation might have caused gonococci to reappear, washings with a mild protargol solution (one-sixth to one-fourth per cent) will be in order. We are in the habit of advising the patient not to make any injection on the days when he has been treated by the physician. After the *status quo* has been established, washings with the nitrate of silver, the remedy par excellence in chronic urethritis, may be resumed.]

When, in spite of treatment, cure is not rapid, or if we wish to accomplish it promptly and in a sure manner, we must resort to *dilatation* of the anterior urethra.

In such cases we must act cautiously, and sittings must have long intervals between them. We begin by going up to numbers 25 or 30 at the first dilatation, and proceed very slowly in the subsequent sittings. Each dilatation will be followed by a decided increase in the amount of purulent secretion, and this recurrence of the discharge persists for two or three days. The fourth day a nitrate of silver lavage should be given: 1 in 1,000 in the anterior urethra; 0.25 or 0.50 in 1,000 in the posterior urethra if it is also invaded. If the reaction is violent, we must use boric acid for a while. The lavages with nitrate of silver are to be repeated once or twice with three or four days interval between them, and we cannot proceed with a second dilatation until complete disappearance of the reactional phenomena, consecutive to the first dilatation, has taken place. These reactional phenomena are the increase in the discharge, the pain on urination, and disagreeable sensation of tension caused by erections. We must also follow the course of the process by means of the urethroscope. We will thus see, as the purulent secretion diminishes, the redness and turgescence of the diseased zones

gradually disappear. The last traces to be seen will always be noted about the lacunæ of Morgagni. As soon as the excretory ducts have taken on again their normal aspect, the mucous membrane should show a physiological color throughout its whole extent, and the folds should form in all parts as in a healthy membrane. The cure will then be probable; and we can be assured of it, if the normal features are still found three or four weeks after the patient has suspended all treatment.

But the course of the pathological process is not always so simple. It often happens that the soft infiltration which we have recognized exists only on the surface of the mucous membrane, and that the deeper parts are the seat of an older hard infiltration. This latter becomes visible after disappearance of the symptoms of soft infiltration, and calls for an appropriate treatment at once.

Finally, there are cases in which, despite all treatment, the soft infiltration possesses an invincible tendency to transformation into fibrous tissue. This peculiar course which, however, is but rarely observed, puts to test the sagacity of the physician. It is, however, useless to persist in an attempt to overcome this tendency; it is then better to suspend active measures and to persist with the palliative treatment exclusively, until such time as the disease, having gradually lost its acuteness, passes spontaneously into the period of chronicity. The treatment then indicated will be that which is appropriate to the new form of urethritis thus constituted.

Hard Infiltrations.— Once the parvicellular infiltration of the preceding period begins to undergo fibrous transformation, we pass to the second stage of the evolution of gonorrhoic lesions—hard infiltrations. To this stage belong the slightest forms of periglandular infiltration, as well as the severest forms of stricture. There exists but one method of setting up a softening and resorption of the newformed fibrous tissue: it is necessary to resort to *dilatations.*

Dilatation.— We have already enumerated the general rules of the method of dilatation and the contra-indications to be met with. We should especially insist on these points: it is indispensable to act with caution and not to try to do too much at the first seance. If we have to deal with a stricture in which we introduce the dilator, for the first time we should not go beyond 18 or 20 F. If the canal has been previously examined with the urethroscope, we may go up to 25 or 30, inversely to the gravity of the lesions observed.

Treatment Consecutive to Each Dilatation.—When the reactional phenomena consecutive to the dilatation are corrected, at the end of three or four days, for example, we should make a lavage of the urethra with a boric solution; then, two or three days later, a lavage with nitrate of silver; this silver washing should be repeated every three or four days up to the time of making a new dilatation. At the same time we will continue, if there is necessity, the symptomatic treatment (injections of astringents in case of discharge, etc.).

[We have stated elsewhere that it is a good plan to perform washing with a four per cent boric solution after each dilatation. This is in accord with the accepted views of aseptic catheterization. It acts as a safeguard, if not entirely as a bactericide; and in a mechanical way by flushing out any microörganisms that may have been introduced inadvertedly despite aseptic precautions.]

Subsequent Dilatations.—At the time of making a new dilatation, we should see that the anatomo-pathologic process set up by the preceding dilatation has completed its evolution, for it is this result which we must strive to reach. Too closely following one another, the dilatations unnecessarily irritate the canal; if there is too great an interval between, on the other hand, they have not sufficient effect to moderate the course of the morbid process and cause it to retrogress. From this point of view the recur-

rence of suppuration which one observes after each seance, may give quite exact indications; it results in fact from the purulent breaking down of infiltration tissue, and indicates, in consequence, the approximate intensity of the process of absorption. We must remark, however, that if the process is too violent it may give rise to a true inflammation capable of extending to the peripheral tissues and then to the whole urethra. The discharge becomes in this case abundant, and a veritable recurrence has taken place. Such an accident is only possible if the rules of the method have been neglected, and the treatment has been badly applied; it can always be obviated by acting with caution and moderation. Should the discharge become notably increased after a seance, the following dilatation should be put off until this recurrence has subsided, and the urethroscopic examination has shown the termination of the process of consecutive resorption. Furthermore, at the following seance the dilatation should be very slight, perhaps even not going beyond the number previously reached. If the reaction is, on the contrary, very slight or *nil*, we may wait a shorter time, and the following dilatation may be increased by two or three numbers. The dilations will be repeated at quite variable intervals; at a *minimum* after *eight or ten days*.

A certain experience is indispensable to determine the exact time at which a new dilatation is indicated, and to what point it can be pushed. The following precepts will be useful in this connection:

1. The seances of dilatation are generally followed by a slight pain at the time of urination. This pain disappears very rapidly, usually after several hours. Besides, the erections are accompanied by a disagreeable sensation of tension in the canal of the urethra; they persist often for several days and after their complete disappearance we must wait eight or ten days at least before proceeding with a new dilatation.

2. If the dilatation is followed by hemorrhage, we must wait at least fifteen days before repeating it. We should make no new dilatation until after the urethroscope has shown the cicatrization of the fissure. This cicatrization requires, at times, several weeks.

3. The purulent secretion becomes, in general, more abundant after each seance. This recrudescence should first entirely cease, and the situation in this respect should be better than it was before, or at least approximately the same, before a new dilatation is permitted.

4. If, on the contrary, the discharge has disappeared, or the urinary threads have diminished after the seance, we may proceed with a new dilatation if the purulent secretion has increased again. It is perfectly understood that the intervals between the dilatations should be of at least eight days.

Such are the indications which may serve as a guide; but we should, nevertheless, always follow the course of the process by means of the urethroscope, and base conclusions upon actual observations which one makes in this way. As we have just said, the discharge increases in the transition forms and in the glandular forms; but it is not generally the same in the dry forms, characterized by an abundant and dense connective-tissue hyperplasia. In these forms there is very often no visible discharge, and if any exists it may disappear completely after each dilatation, only to reappear after eight or ten days. However, even in this case, we must not be led to use the dilator at too frequent intervals. The course of the process of resorption is indeed not more rapid here than in the preceding forms; it is, on the contrary, slower and the treatment should often be an extremely prolonged one.

Forcible Dilatations.—Whatever may be the form of urethritis we encounter, we must be on our guard against too violent dilatations at the outset of treatment. We must, on the contrary, act slowly and progressively. The

softer foci should be the first to pass into resolution. It is only later, when they have been completely absorbed, that we should resort to more energetic and more violent dilatations, capable of softening them, or of setting up an atrophic process in the hardest infiltrations.

If, on the contrary, the dilatations are pushed too vigorously at the outset, they may give rise to the formation of extensive fissures. In examining then the urethra through the endoscope, we will see persisting, alongside of the tear, small nodules of infiltration and glandular groups which will be influenced with difficulty later on, and to bring about whose resorption much pains and time is required.

These forced dilatations may present another inconvenience; they set up at times a revival of the acute process which has seemed calmed — a recurrence. It is now that we see *periurethral abscesses* form. These are altogether exceptional accidents, which can always be avoided by adhering strictly to the rules laid down.

It may happen, too, that a patient, in the course of treatment, is exposed to a new source of contamination, and that the latter sets up acute phenomena which appear or exacerbate immediately after a dilatation. The patient will naturally not admit the exposure (*quïvis syphiliticus* [*blennorrhagicus*] *mendax*), and will blame the treatment with having caused the recurrence; but he will be betrayed by the abundance of gonococci which are found in the discharge, and which a new infection alone can explain. This is an unfortunate accident, but happily of rare occurrence, and one which we are powerless to prevent. The responsibility is incumbent upon the patient.

[Reappearance of gonococci, few in numbers, may show up after such exacerbations, caused by over-excessive dilatation. Such an event has not always the significance of relapse attributed to it by the patient. In a certain sense we may rather look upon it as a gain. Pent-up gonococci in the depth of the follicles might have been set free by the

action of the dilator, and the reactive purulent discharge floats them out. We will now proceed with the use of antiseptic astringents (permanganate, nitrate of silver in mild solutions) until the subacute exacerbation has subsided, and then resume dilatation.]

Course and Treatment.— So long as the discharge has not disappeared, we will continue to perform, successively, dilatations and lavages, observing always with the urethroscope the results obtained and the progress of the lesions. We thus gradually reach a number 40 dilatation, and even go beyond this if necessary. If we observe that there still remain infiltrations in the bulbar region which have not been absorbed, we must have recourse to the *curved* dilator whose action is especially exerted in this region. If they persist, on the contrary, in the very anterior portion of the penile region, we introduce the *straight* dilator only half way, so as to place that portion of the instrument which dilates the most, opposite the diseased areas. It may also happen that a carefully made urethral examination permits neither of the discovery of infiltration, nor of the plaques of connective-tissue hyperplasia, and still there may remain a slight discharge. We must then search for the source of this secretion in the glands or the isolated lacunæ in which the inflammation is shut in, and which cannot be reached by dilatation. This is a rare eventuality, but here the urethroscopic treatment steps again in its domain, because cure cannot take place except in going in and destroying the focus of suppuration *in situ*.

Complementary Operations.—Local caustic applications by means of an endoscopic brush are absolutely inefficacious. Kollmann has had constructed a small syringe armed with a long, slender cannula (Figs. 18 and 19, p. 77) through which he introduces a caustic injection into the diseased cavity. We may also make use of a small curette to explore the gland; but Oberländer recommends quite

particularly to destroy it by electrolysis. This little operation is very simple, and is done in the following manner:

A long steel needle (Fig. 16, p. 77), insulated almost to its extremity and having a blunt point, is pushed into the infiltration mass or into the glandular cavity; it is then attached to the negative pole of the galvanic battery. The positive electrode is applied upon the patient's thigh or even upon the penis, at the nearest point possible to the negative electrode. The current should not exceed two to two-and-a-half milliampères. As soon as electrolysis has been effected, we see a little whitish froth emanate around the needle thrust into the area. The time of application does not exceed two or three minutes, but several weeks are required to obtain elimination of the eschar and secure cicatrization. During this whole time active treatment is to be suspended. Finally, it may happen that dilatation is powerless to soften the infiltrated nodules and the old cicatricial plaques surrounding the glandular masses, they being situated too deeply in the mucosa. This is an exceptional circumstance, but it may nevertheless present itself. Oberländer recommends to transsect these rebellious foci by means of a little blade (Fig. 15, p. 77) introduced through the urethroscope, or else to make a number of electrolytic punctures so as to set up a reaction. We may add that, in the great majority of instances, the method of dilatation, such as we have described it, always leads to cure.

Duration of Treatment.—The length of treatment is extremely variable; it depends, first of all, on the nature and the extent of the lesions. Recent infiltrations, superficial and not very dense, will disappear readily under the influence of a few dilatations. The old connective-tissue masses, on the contrary, will offer great resistance to treatment; much perseverance will be required to transform them into inoffensive cicatricial tissue, incapable of setting up a recurrence.

Aside from these differences, which result from the gravity of the lesion, many other causes may intervene to prolong treatment. These are, first of all, causes often independent of the patient's will, and which do not permit him to restrict himself to an appropriate regimen or to follow out his treatment with a regularity which is indispensable. It is often, too, his intractableness; but most often there are individual characteristics which cause lesions of benign appearance to resist for a long time an otherwise well conducted treatment. Recurrences are produced by the slightest trifles, and the affection does not improve without our being able to clearly define the cause. This is especially noted in lymphatic subjects, or those affected with a tuberculous taint. We must, in these cases, act with the greatest circumspection and refrain from violent maneuvers and from remedies of too great activity, which will only serve to make matters worse. During the whole course of treatment the patient will continue to use astringent injections as long as there is any discharge. When the discharge is dried up we will see, swimming in the urine, small purulent flakes, at first large and heavy, then more slender and light. As long as we can thus find traces of suppuration it will never be possible to guarantee that everything of an infectious character has disappeared, and thus that all danger of contagion is at an end. Even supposing that the most minute examinations, repeated several times, have not revealed the presence of the gonococcus in the products of secretion, nothing proves that these organisms do not exist deeply seated in the areas still affected. They may, then, under the influence of this or another cause, constantly begin again to increase and reappear in the threads or in the discharge; the patient will then assume again the infectious character which he had appeared to lose. This hypothesis which we advance is verified only too often to leave any doubts about the matter. Patients declared cured and fit for marriage, after

an examination of the threads, which has been negative, present themselves again, complaining of inexplicable recurrences. We can only consider as *cured* those patients who no longer present the slightest trace of purulent secretion (discharge or urinary threads), [and neither gonococci nor pus-cocci,] and in whom the endoscopic examination of the most complete and careful kind has demonstrated the disappearance of the lesions previously observed.

POSTERIOR URETHRITIS.—The mucous membrane of the posterior region is thin, delicate, and almost entirely deprived of cavernous tissue; the lesions met with are also much less deeply seated and less severe than those of the anterior urethra. We find neither the large nodules of hard infiltration nor periglandular inflammatory masses; most often the blennorrhagic inflammation remains purely catarrhal and superficial. In many cases it suffices to employ a few washings of nitrate of silver (0.25 to 1 in 1,000) to make these lesions disappear. The washings are repeated every two or three days; the cure is rapid, provided the anterior canal has previously been cured, as we have already pointed out.

If however, the posterior region is affected with hard induration, the nitrate of silver washings are not sufficient, and we must have recourse to dilatations. For dilatation of the posterior urethra, we must begin with complete anesthesia of the region by injecting a few grams of the usual solution of cocaine or of eucaine (1 in 30). We employ the Beniqué form of dilator. This is to be carefully lubricated, and introduced into the canal according to the rules of catheterism with instruments of the same form. The introduction is very easily accomplished, but it may happen that the point of the instrument remains fixed in the region of the bulbar *cul-de-sac;* this inconvenience is avoided by raising the dilator at the moment it traverses this region, and thus guiding the point along the upper wall of the canal. It is also by the same maneuver

that the instrument, once having reached the prostatic region, will avoid the verumontanum which is at times swollen and very sensitive, chiefly when the patient gives himself up to venereal excesses. As soon as the dilator has penetrated into the prostatic region, it no longer meets with obstacles, provided the canal is not constricted at this point by cicatrization of old prostatic abscesses. These strictures should then be dilated beforehand by means of metallic bougies.

The first dilatation should not exceed numbers 25 or 30, especially if hard infiltrations exist. The operation is done with extreme ease and, so to speak, without any pain. The same rules are to be observed as those which we have indicated for dilatation of the anterior urethra. Furthermore, the severest lesions are always situated in the anterior region; therefore this region should be cared for first, and well dilated before we pass on to the posterior canal.

The dilatations should be separated by an interval of fifteen days at least, during which nitrate of silver washings are to be made (0.25 to 1 in 1,000) according to the sensitiveness of the patient, repeated every three or four days.

Dilatation of the posterior urethra progresses very rapidly, and we succeed in a few sittings in reaching number 40. Besides, a posterior urethritis offers but little resistance to treatment once the anterior canal has been brought into a normal state. If, however, the affection is rebellious, it is undoubtedly because we have to do no longer with a simple urethritis, but that there exist complications or extensions of the gonorrhoic process to neighboring organs (prostate, seminal vesicles, etc.). The diagnosis should also be very precise in this regard, and a careful exploration should indicate whether there exist foci of Prostatitis or Spermatocystitis capable of keeping up a perpetual gonorrhoic urethritis, or of becoming the point of departure for a recurrence.

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The diagnosis and treatment of these complications are outside the scope of this work. [The Editor, trying to enhance the usefulness of this volume, has dwelt in the next chapter on the diagnosis of these conditions.]

CHAPTER XIV

*PALPATION AND EXPRESSION OF COWPER'S, THE PROSTATE, AND THE SEMINAL GLANDS**

[BESIDES the different urinary tests, which convey valuable information as to the origin of the threads, we possess a much more accurate way of determining whether Cowper's glands, the prostate, or the seminal vesicles are involved, by using the method of palpation and expression of these organs. Physiologically, the terminal contractions of the muscular apparatus at the end of micturition, are intended to empty the bladder entirely, and also rid the efferent ducts of the accessory genital glands of their normally scanty secretions. But when the mucosa of the posterior urethra is affected, and the process of chronic inflammation has extended into these glands, changes occur in the texture of these organs. Some of the glandulæ prostaticæ undergo cystic degeneration, or intumescation (prosatitis glandularis) with partial or entire occlusion of their ducts. In such a case the terminal contractions will not suffice, and we must look for other means to obtain the pent-up contents of these organs. We will therefore perform expression.

Before going into details, it may not be amiss to venture a few words on the technique of expression. Most authors recommend the recumbent position. The patient lies on his back, with his knees flexed. The right index finger, protected with a well-lubricated rubber stall, is then introduced into the rectum, to a height varying with the position of the gland we wish to express; while the thumb rests on the anal muscles. The index finger in the rectum now performs, with its palmar surface, stroking motions

* By the Editor.

alongside the anterior wall of the rectum, while the thumb exteriorly makes passes toward the index finger. Meanwhile the left hand placed on the symphisis pubis exerts a downward pressure on the pelvic viscera.

We are somewhat partial to the performance of these evolutions in the knee-elbow posture of the patient. In this latter position we have succeeded in causing secretions to appear at the meatus, when the former posture proved ineffective. In bringing the patient into this position, we provide, it seems, natural means of emptying these glands. The intestines gravitate downward and forward, thus relieving the intra-abdominal pressure. The lowest part of the rectum by its fixation does not follow the intestines in their forward traction, but bulges toward the sacrum. This seemingly contradictory movement of the prostatic segment of the rectum in forming a convexity backward instead of following the bowels in their downward gravitation, we try to explain by the fact that the upper part of the sigmoid flexure follows the descending colon in its forward and downward movement, causing the sigmoid to form a bend at an obtuse angle with the rectum, which in turn causes the lower part of the rectum to form a convexity and to bulge toward the sacrum. Anyone can convince himself of this fact by introducing into the rectum a Sims' speculum while the patient is in the knee-elbow position. The rectum will be seen to follow the respiratory movements like a flap, up and down, but always, especially in its prostatic part, raised on a higher level and easier of access to the palpating finger than in the recumbent position. Besides, in performing expression, the secretions will, in this position, gravitate in a natural way through a preformed *inclined* plane toward the meatus. For the operator the whole procedure is an easier one; he can exert and grade the pressure with more leisure, the finger does not tire out as quickly as in stroking upward, and to the patient the discomfort of the procedure is in no way aug-

mented. We have found that they can stand massage of the prostate—for curative purposes—much longer and better when in the knee-elbow position than in the recumbent one. We will, of course, avoid this position in older people, where arterio-sclerosis contra-indicates it.

Expression of Cowper's Glands.—The anterior urethra is washed, without catheter, by the hand syringe and soft rubber nozzle (Figs. 5 and 27), with a warm four per cent boric acid solution. To this end the penis is grasped with the left hand, the index and thumb keep the orifice in contact with the nozzle which should fit tightly in the meatus. The fluid is now gently injected until the urethra commences to bulge. The thumb directing the piston downward now feels an obstacle caused by the contraction of the compressor urethræ muscle. The fingers which hold the meatus against the nozzle now relax their grasp, and the fluid is allowed to escape. This maneuver is repeated until the fluid returns perfectly clear. The index finger of the right hand protected by a stall is now introduced to the height of about the first or second phalanx as the case may be. We stop at the lower border of the prostate, withdrawing the finger a little so as to avoid touching it at all. Pressure is now exerted by the index finger—with its volar side—in the manner of massaging movements downward and towards the operator. After doing this for a half to one minute we stop, allowing the thumb to propel the secretion towards the meatus by passing it strokingly forward alongside the membranous part of the urethra. We do not always have the satisfaction of seeing secretion appear at the orifice, even if the glands are diseased. The secretion may be too scanty. In such a case we may, if we care to, mop the deeper urethra through the endoscope and examine the secretion so obtained. However, as it is a rare event to find the glands of Cowper alone affected, we must not lay too much stress upon the negative result of our examination.

In almost all cases there will be an involvement of the prostate, which by its larger surface offers a greater avenue to all acute and chronic processes infesting the posterior urethra.

Expression of the Prostate.—The digital manipulation of the prostate through the rectum, for diagnostic purposes, is almost identical with that carried out for curative reasons, known as massage of the prostate. It differs only in the degree of pressure and the duration of the manipulation. To make sure that we are obtaining the contents of the prostate only, we must eliminate all possible sources of error. We will, therefore, after the patient has urinated, wash the anterior urethra and perform intra-vesical irrigation without catheter with a warm four per cent boric acid solution. This the patient voids into a graduate, and of the known quantity injected, about fifty grams are retained in his bladder. This serves as a residual fluid or vehicle, which can be voided in case expression should not yield enough discharge for examination. The washing is made in the manner mentioned above. But from the moment the thumb feels an obstacle to the further progress of the injected fluid caused by the contraction of the compressor urethræ muscle, we must change somewhat our technique of injection.

Previously, when we have endeavored to cleanse only the *anterior* urethra, the compressor reacted against the influx in its physiologic way by contraction. As we were not desirous of washing the posterior urethra, we have, in the former instance, ceased to push the piston forward, at the same time releasing the grasp on the meatus. The fluid then returned anteriorly, as the compressor acted like a barrier between the anterior and posterior urethra. It is just this contraction of the compressor that we must now overcome in order to fill the bladder by hydrostatic pressure alone. Consequently we neither release our hold on

the meatus, which fits the nozzle snugly, nor do we increase the propelling pressure; we simply keep, with the syringe in position, the bulging urethra filled, and pause for a while. The compressor soon tires out. We cause the patient to perform inspiration and *prolonged* expiration. Under the continued pressure of the liquid and the negative abdominal pressure at the height of the expiration, the compressor soon relaxes, and the fluid enters the posterior urethra and the bladder. This is evidenced by the collapsing of the ballooned urethra. Now the piston is pushed slowly forward, and the fluid enters the posterior urethra and bladder without impediment. The patient is allowed to void the fluid in the natural way.

After this procedure, which must be repeated until the fluid returns clear, the patient takes the knee-elbow position, and the right index finger, protected as before, is introduced in the rectum. Here again we have to change our mode of procedure. We will now get at the prostate directly, which will be felt as a flat, semicircular tumor, consisting of two lobes, with a central longitudinal furrow, and occupying the anterior aspect of the rectum.

The examining finger will at the same time make us cognizant of the density, texture, and size of the organ. A chronic diffuse prostatitis will cause, besides a mostly unilateral enlargement, a bulging into the rectum with an even or slightly nodular surface. A chronic parenchymatous process, where groups of glands break down, forming pus-cavities, will reveal soft, doughy places painful to the touch. Cystic enlargement of portions of the prostate due to retention by occluded or clogged ducts will impart the same sensation to touch, but cause little or no pain owing to the non-purulent character of the contents. But as these objective symptoms are variable and cannot be depended upon solely, only the expressed contents of the gland will enable us to form an opinion.

In order to do this we now gently press upon the gland

by lateral and vertical stroking motions directed downward and backward towards the operator, and there will soon escape a few drops of a white viscid and limpid fluid from the meatus. This we receive directly on three slides. One is used for an immediate microscopical examination, while the other two are reserved for examination with stains, to search for gonococci. In order to ascertain whether we have to deal with prostatic secretion, we add to the drop on the first slide a drop of a one per cent solution of phosphate of ammonia, put on a cover-glass and allow it to dry. This will bring out *Boettcher's* crystals, the main attributes of every prostatic secretion.

Next in frequency to appear are the stratified amyloid bodies showing concentrical rings. They are readily discernible, but can be better recognized by the addition of a drop of Lugol's solution (iodin 1.0, iodid of potassium 2.0, ag. dext. 100.0). The secretion will further show hyaline and lecithin bodies, looking like minute fat-globules, as frequent, but not always present, elements of normal prostatic secretion. If, in addition to these, we find leucocytes, red blood-corpuscles, and numerous or grouped cylindrical epithelium in the specimen, the diagnosis of chronic prostatitis is established. The second and third slides solve the question whether there are gonococci present or not. In order to decide this, we proceed to dry, fix, and stain one specimen with methylene blue and decolorize the other after Gram's method in the manner described elsewhere (p. 22). In very doubtful cases, and when marriage is contemplated, cultures should be resorted to.

Expression of the seminal vesicles is the next and final step to ascertain the condition of that organ in order to determine in what degree, if any, it participates in the process of chronic gonorrhea.

The preliminary steps in cleansing the anterior and posterior urethra and in washing the bladder are the same as in the previous instances. The manipulating index

finger is now introduced beyond the prostate, but without exerting any pressure on it, and as high up as possible. As the seminal vesicles are situated laterally, their ducts converging towards the sinus prostaticus, the finger must necessarily be stretched to its greatest extent in order to reach the vesicles. If spermatocystitis gonorrhoica exists, as it is liable to in most cases of long-standing suppuration of the posterior urethra, the enlarged and engorged pouches will be readily found and "stripped" after the method of *Fuller* who recommends stripping of the seminal vesicles as a curative agent. The secretion so obtained by the massaging finger-tip, will show up at the meatus when present in sufficient quantity. It is received on slides and first subjected to microscopical examination without drying and staining. The presence of spermatozoa is, of course, the cardinal sign that the procedure was successful, and establishes the diagnosis. The admixture of leucocytes and probably of a few red blood-corpuscles will be evidence of an existing vesiculitis. In order to determine the presence of gonococci, the specimen must be dried, fixed, and stained in the manner described elsewhere. In doubtful cases we will have to resort to cultures. But there are cases in which the massage of these glands will not cause their contents to appear at the meatus. As to the prostate gland this will be the exception, but the seminal vesicles very often do not yield secretion enough to traverse the distance to the meatus. In either of these instances the viscid, opalescent, residual urine, or injection fluid voided immediately after the manipulation, will contain the elements pertaining to each of the glands. By allowing the urine to settle or, better still, by centrifuging it, we can obtain material for microscopical examination. But it should be noted as regards the prostate that, from this specimen, Boettcher's crystals cannot be demonstrated, as the ammonia phosphate test does not materialize in the presence of urine. The spermatozoa are easy of demonstration.

OBSERVATION OF PATIENTS

Treatment cannot be rationally begun and pursued unless the diagnosis is established with precision, and the course of the disease be constantly watched; it will be indispensable to take the history of each patient, because the most faithful memory cannot retain all the details. We insist on this point, since faults of memory might have deplorable results. The observation should include especially all the details observed by the endoscope at the time of the first examination, and all the changes which are subsequently noted. We should note each time the degree of dilatation reached, as well as the results obtained, and the symptoms complained of by the patient. The following, for example, are the observations made upon several patients affected with various simple forms of urethritis which we have described. These observations are given wholly from the point of view of treatment by dilatations. Therefore we have put down neither the washings, the symptomatic treatment, nor the search for gonococci, etc. [This should never be omitted in record keeping.]

Chronic Urethritis; Hard Infiltration of the First Degree, Glandular Form Without Complications

M. B. 24 years. No antecedents of genito-urinary trouble. Infection six months ago. At present muco-purulent discharge in minimal quantity. Exacerbations after excesses of all kinds. Urine of the first glass filled with threads.

May 1.—Urethroscope number 23. The bulbar region is normal, the middle third of the canal is red, swollen, having large folds; the anterior third is irregularly scattered with glandular orifices and swollen lucunæ which are red. The mucosa in this region is pale and smooth, forming thick, rigid folds. Dilatation to number 28.

May 10.—Tube number 27. The redness of the middle third has disappeared. The infiltration is well limited to the anterior third where the zones of infiltration are clearly seen to be flat and of variable size, containing inflamed glands and lacunæ. Dilatation to number 30.

May 18.—Tube number 27. Plaques of infiltration less pale, glandular orifices smaller, folds of the mucosa more supple and finer. Dilatation to number 32.

June 6.—Mucous membrane uniformly colored in the whole extent of the anterior canal; few glandular orifices visible; mucous membrane finely folded, excepting at about two centimeters from the meatus where there still exists an infiltrated zone. Dilatation to number 34. The patient sees no flow; the urine contains only mucus-shreds.

June 23.—The infiltrated zone presents a red-surface, slightly desquamating, with some inflamed glandular orifices. Dilatation to number 35.

July 3.—Desquamation is no longer visible, and the mucous membrane is smooth; some glandular orifices still visible, have a normal appearance. Cured.

August 9.—Cure still maintained.

Chronic Urethritis; Hard Infiltration of the First Degree, Dry Form

F. 29 years. Gonorrhea seven years ago. Rapid improvement. Since this time the patient has seen no discharge, and considering himself well, has believed that a complete cure was effected. For about three months he has noticed that in the morning the meatus is moist, and that in pressing the canal he could squeeze out a small quantity of pus.

February 1.—Urethroscopic tube, 23. At the bulb the mucous membrane was reddish and of velvety aspect, uniformly dull; further forward the color is paler, the folds are irregular, and the surface is in a state of desquamation. In the middle of the penile region the membrane is pale rose color with large folds. Further forward, the membrane is nearly normal, but presents a few scattered orifices of glands which are not inflamed. Dilatation to number 27.

February 14.—At the bulb the redness has disappeared and the longitudinal striations are seen again. Further forward, *status quo*. Dilatation to number 29.

March 4.—Same condition. Dilatation to number 31. The patient notices no discharge.

March 19.—The membrane of the penile region becomes more moist and shining. A few swollen glandular openings. Dilatation to number 32.

March 30.—Dilatation to number 33.

April 10.—Dilatation to number 34.

April 21.—Epithelial desquamation is no longer noted. The longitudinal striæ have slightly reappeared. The folds are normal. The membrane is moist, smooth, shining. The few glandular orifices visible are without pathological features.

May 1.—Same condition. Cured.

Chronic Anterior Urethritis; Hard Infiltration of the Second Degree, Glandular Form.

D. 37 years old. Gonorrhea three years ago. Persistent discharge disappearing at times for a few weeks, only to reappear without any appreciable cause.

January 9.—Tube number 23. Region of the bulb uniformly bright red, slightly desquamating. The anterior two-thirds of the canal are pale and scattered with red plaques of slight brightness. The normal striæ have disappeared, the folds are few and thick. The glandular orifices are red and prominent. The infiltration is especially marked at the union of the anterior third of the urethra with the middle third. We here meet with large nodules, which are prominent and studded with hypertrophied glands. Dilatation to number 25.

January 27.—Tube number 29. The bulbar region seems normal. In the anterior region the plaques of infiltration are better made out, the aspect is pale red and lusterless. The glandular orifices appear in large number. Dilatation to number 27.

February 10.—Dilatation to number 29.

February 20.—The discharge has disappeared. The urine shows purulent flocculi. Dilatation to number 31.

March 2.—Tube number 29. The normal zone, at first limited to the bulb, extends forward. In the anterior third glandular orifices are still to be seen, with widely open mouths, some being surrounded with a violaceous red zone. Dilatation to number 33.

March 19.—Tube number 29. We still meet with some hypertrophic glands with wide openings. In the middle third rosy cicatrices appear, surrounding the glandular orifices and extending upon the neighboring mucous membrane. In the anterior third the normal striation reappears. The urine contains a few scattered threads. Dilatation to number 34.

March 30.—Dilatation to number 35.

April 9.—The anterior third is entirely normal. In the middle third the glandular orifices are scarcely any longer to be seen. In the lower wall a linear cicatrix is noted, due to the dilatations and traversing old glandular areas. Dilatation to number 36.

April 19.—The urine is quite limpid. Slight mucus-threads. Dilation to number 37.

April 30.—Dilatation to number 38.

June 2.—The mucous membrane has recovered its normal color throughout, it is brilliant and falls into folds like a healthy membrane. The striations are noticeable. In the middle third are still to be seen a few orifices of glands without any appearance of inflammation.

Chronic Urethritis; Infiltration of the Second Degree, Dry Form

P. 40 years of age. Gonorrhea fifteen years ago. No complications. The discharge continued for a long time, and for several years the patient saw a morning drop when any sort of excess had been committed the night before. For the past six months the discharge has reappeared.

March 26.—Tube number 23. This passes the penile portion in giving a uniform sensation of resistance. The mucous membrane in the whole length of the canal is rosy gray and of dry and dull aspect, presenting in no part the usual striation. No folds, no glands in the anterior third, the canal remains open. The tube has caused a slight tear in the middle of the penile region, which has occasioned a slight hemorrhage. Dilatation to number 25.

April 5.—Dilatation to number 26.

April 16.—Dilatation to number 27.

April 30.—Tube number 25. The bulbar region has taken on again a more rosy appearance; the middle third folds, and a few glandular openings are seen. Dilatation to number 28.

May 10.—Dilatation to number 29.

May 20.—The discharge has disappeared. Purulent flakes in the urine. Dilatation to number 30.

May 30.—Dilatation to number 31.

June 12.—Tube number 27. The posterior third seems normal, the middle third folds quite well, and takes on a bright red color. Dilatation to number 32.

June 25.—Dilatation, 33.

July 1.—Tube number 29. In the middle third, the glandular orifices are less apparent. Dilatation, 34.

July 12.—Dilatation, 35. Slight hemorrhage.

August 1.—Tube number 29. In the anterior third large red folds begin to show themselves, the glandular orifices are quite visible. Dilatation, 35.

August 12.—The urine still contains some purulent flakes. Dilatation, 36.

August 22.—Dilatation, 36.

September 1.—Dilatation, 37.

September 15.—Dilatation, 37.

September 27.—Dilatation, 37.

October 15.—Dilatation, 38.

October 30.—Dilatation, 38.

November 30.—The membrane has taken on again a rose color in all parts and folds almost normally. The glandular orifices are normal.

December 30.—Same state; no more flocculi in the urine.

CHAPTER XV

*CHRONIC GONORRHEA AND MARRIAGE**

[THERE is still a controversy in reference to the time as to when the gonococcus should be looked upon as definitely *extinct* from the uro-genital apparatus. The whole question, which was brought out with such vehemency at the Sixth Congress of the German Dermatological Society at Strasburg, in 1898, is still unsettled. In one point all parties agree, namely, that the gonococcus must be destroyed in order to effect a cure. While Behrend and his followers maintain that they can accomplish this by the use of astringents, as of old, Neisser and his disciples have shown that the silver-salts (Largin, Protargol, etc.) are capable of annihilating the gonococcus with a certainty not achieved by any other known agent. But the whole question becomes a mooted one when the infectiousness of chronic gonorrhea is considered.

It goes without saying that, as long as there are gonococci present, no matter how few in number, the discharge is infectious; but the matter becomes complicated when they reappear after repeated painstaking examinations have failed to demonstrate their presence. The adnexa of the uro-genital apparatus furnish ample hiding places for their continued propagation. These are the subepithelial and connective tissues, the lacunæ of Morgagni, Littre's glands, and other follicular structures, the prostate, the seminal vesicles, and the efferent ducts grouped about the colliculus seminalis or caput gallinaginis. In few cases of gonorrhea is the infection limited only to the anterior portion of

*By the editor.

the urethra or to its superficial structures. Such cases do exist, but unfortunately they are few. The path by which the gonococcus reaches the deeper structures is a wide-open one to its ingression. In its strife with the leucocytes, by invading them, and in its being carried off and toward the surface by the same power which it was bent on destroying, the gonococcus will, under certain conditions, settle itself in the deeper structures. The gonococcus has been considered heretofore as chiefly an epithelial and intercellular parasite—one which thrives on the protoplasm of the leucocytes. Recent researches have shown, however, that it is not only capable of infesting the connective tissue, but that it may provoke suppuration there and be carried away bodily, so to say, by the blood- and lymph-channels to remoter regions, causing a veritable metastasis.

In chronic gonorrhea, therefore, the habitat of the gonococcus will be found in the submucous and connective tissues and in the ducts of the different follicular structures. If we now subject the scanty surface discharge of such cases, which hardly show any clinical symptoms, to a microscopical examination, we will mostly find mucus, muco-pus, epithelium in its different transition forms, bacteria, and sometimes a few ill-defined gonococci; but mostly none at all. We thus pronounce the gonorrhea cured, and the patient as not infectious. The fallacy of such an opinion may manifest itself in a shockingly surprising manner by causing a gonorrheal infection in the female, or *vice versa*. Schiller, in examining three hundred women, maintains that when gonococci were present clinical symptoms were never wanting. Kollman has found gonococci in thirty per cent of his cases of chronic prostatitis, where no clinical symptoms were evident. Kapitowsky, in examining one hundred prostitutes, found in eight per cent of the cases gonococci in their cervical discharges. These women had been declared—clinically—recov-

ered, and discharged. Neisser has always claimed that gonococci may be present in the female genitalia, even when subjective symptoms and other microscopical signs are wanting. These and kindred questions emanate from the fact that in some continental countries the law provides a registration of prostitutes, a weekly medical examination, and gratuitous treatment in hospitals. They are discharged when a repeated microscopical examination fails to show the presence of gonococci. Although not belonging within the scope of this treatise, we must touch the subject, as the possibilities of the protean aspect of the gonoccocus may, with some modifications, be applied to the male also. Besides, the life-history of the gonococcus in the female is of more than paramount interest to us. The registering of puellæ publicæ, so alien to the American idea of consideration even towards fallen women, only partly removes the opportunities of infection; while the greatest danger lies in continental countries, as well as in ours, in clandestine prostitution. Nothing short of educating the masses to the perception of the great social danger which lies in an attack of gonorrhea, or legislation like that of the state of Michigan, will mitigate its ravages, and save hecatombs of wrecked lives in both sexes, but especially of women.

The question naturally arises, is gonorrhea curable and, if so, when may we pronounce a gonorrhea cured? Excellent observers, like Behrend and his followers, hold that gonorrhea, especially in the female, is incurable, and some gynecologists coincide in this pessimistic view. No doubt there is ample ground for such an opinion. Those who have had occasion to view the specimens gained by operative interference on the female pelvic organs, will bear witness to the ravages wrought on the uterus and it adnexa by the ascending gonorrheal infection. In the male, strictures, chronic prostatitis, seminal vesiculitis with its attendant prostato- and spermatorrhea, sclerosing epi-

didymitis, bladder and ascending kidney affections, will bear out the unenviable record of the persistency of the gonococcus. And yet in the face of all these overwhelming proofs, we are free to assert that gonorrhea is a *curable* disease. We admit that the gonococcus, once having invaded the deeper structures, is hard to eradicate, and that the tissue-changes due to its action are well-nigh irreparable; but are not these dire results due to the rough empiric methods of treatment handed down to us from time immemorial; when astringents were the Alpha and Omega of local treatment in acute gonorrhoic urethritis, and nauseating balsamics had wound up a cure which, in a few instances only, could be looked upon as such?

In those times, when the causative factor of gonorrhea was conjectured but not yet discovered, the want of such an etiological knowledge had biased the greatest minds, and hence the treatment necessarily could not be other than empiric. But this has changed since Neisser's discovery of the gonococcus, and the researches made by Steinschneider, Schäffer, Schlangenhausen, Gohn, Wasserman, and others about the morphology and biology of that microbe. These researches culminate in the following facts: The gonococcus is the only causative factor of gonorrhea. It traverses cylindrical epithelium with predilection, but under favorable circumstances attacks pavement epithelium also, especially by way of fissured interstices, and may settle in the deeper structures of the mucosa and adjacent connective tissue. It and its toxins exert an inflammatory action on the blood-vessels, causing them to become permeable to the white blood-corpuscles and to the exudation of pus-serum. The gonococcus and its toxins are pyogenic, and both of them may cause metastasis in almost any organ of the body by way of the blood- and lymph-channels.

But these untoward effects of the gonococcus may, in a measure, be avoided if Neisser's teaching and the treat-

ment pointed out by him is better understood and practiced. It is his *etiological* treatment of acute gonorrhea with the soluble silver-salts which, up to the present, cannot be superseded by anything else. Their penetrating power to destroy the microbe, even in the deeper strata of the mucous membrane, is unequaled. When these facts will become better known to the profession, auto-reinfection by gonococci, permitted to become latent in the deeper structures, will become a rarer event, and the prognosis of gonorrheal infection in both sexes will be a more hopeful one.

To turn to the question of marriage of a patient who has had gonorrhea, the physician will have a highly responsible question before him to decide. We here emphatically take the stand against Kromayer's contention that the physician shall decline the responsibility of deciding. Patients yet infectious will then marry in larger numbers than now, without asking their physician whether they are justified to do so. Let us utilize the only exact method given us by Neisser, which is to search for gonococci.

We start with a given case of chronic gonorrhea. The patient wants to know whether he is yet capable of infecting, and makes his matrimonial venture dependent upon our finding. We have repeatedly examined the threads in his urine, and have found no gonococci under the microscope. On the strength of this examination shall we pronounce this man cured? Certainly not. We will bear in mind that there might be gonococci in the subepithelial and connective structures, in the glands of Littre, in the lacunæ of Morgagni, in the prostate, and in the seminal vesicles. What means do we possess to entice these parasites to the surface? We will apply to the urethra a provocative injection of either a two per cent solution of nitrate of silver or an irrigation of a warm solution of bichloride of mercury, 1 in 10,000—preferably the first one. A reactive irritation of the mucous membrane will follow, and a discharge, more or

less copious and of short duration, will establish itself. We will find leucocytes, epithelia in various transition forms, mucus, and gonococci if such were present in the deeper structures. But right here the gravity of the question sets in. The presence of gonococci is proof positive, and needs no further confirmation. But if repeated and thorough examinations have failed to show the presence of gonococci, are we just as positively enabled to draw our conclusions from this negative result? Certainly not. There are several possibilities: (1) There are really no more gonococci present. (2) There might be gonococci present, but we have failed to demonstrate them either because of faulty technique or because the provocative discharge had not dislodged them. (3) The discharge contains pus-corpuscles in abundance, but no gonococci.

To determine the first *two* points and make sure that there are no more gonococci present, or if supposedly present, we have somehow failed to demonstrate them by the microscope alone, we must have recourse to another process of examination, namely, to cultures. The best culture-medium for the gonococcus is human chest serum-agar, mentioned elsewhere in this volume (p. 25). To inoculate such a tube or plate, and breed the germs in an incubator, will be an easy task for those possessing the knowledge of bacteriology and an outfit. Those not versed in such researches will do well to send the specimen to a laboratory for examination.

The practitioner in this country is getting accustomed to send the culture-tube inoculated by him with the exudation of his patient's throat to the bacteriological department of his board of health, in order to obtain a bacteriologic diagnosis of diphtheria. We sincerely hope that hypercritical moralists will not obstruct legislation if, by a concerted action of medical societies, the local boards of health would be obliged or permitted to examine gratuitously, or for a small fee, the suspicious secretions or

threads. This could be done by collecting the pus or the threads in a small sterilized test-tube, and sending it in for examination.

Heiman has shown that from the contents of such tubes, when sown on plates, the gonococcus could be obtained and isolated when brought to the laboratory, hours later. The mode of obtaining the threads in the usual way, by fishing them out of the urine, is a faulty one, and does not permit of a conclusive answer. In case of a negative result, even if Gram's decolorization had been used, we will always entertain some misgivings whether one or the other of the unexamined threads might not perhaps have contained gonococci. Therefore we deem it indispensable, in order to exclude any fault in the technique, to avail ourselves of the *centrifuge*.

It seems that Heiman was the first to employ the centrifuge in connection with culture-media for the collection of gonorrheal threads. The threads thrown down by the centrifuge are afterwards inoculated on the culture-medium. Thus we are sure that all available threads have been planted, and if gonococci are present, they will certainly show up in colonies. These are now subjected to a microscopical examination. It is essentially necessary that the decolorization by Gram's method be used, as this alone furnishes a reliable criterion in determining whether the culture is or is not that of a gonococcus. The examination of cover-glass preparations, first with the methylene-blue staining, and then after Gram's method, gives for all practical purposes very satisfactory results. But in deciding the advisability of marriage we must avail ourselves, not only of a thorough clinical and microscopical, but also and foremost of a bacteriological examination, with the use of Gram's method.

When using the urine, that is, the filaments or threads suspended therein, for cover-glass examination only, we will direct the urine to be voided in two portions. It is

best to centrifuge it, even for this purpose. In a gross way, the first portion will contain the threads of the anterior urethra, the second the secretion of the posterior urethra, and probably of the prostate if pressed upon while urinating. It has been shown elsewhere how to proceed when we desire to determine the locality whence the threads or the expressed material are coming. For simple cover-glass examination we will place the thread on a slide, spread it out with a sterilized platina loop, dry it, draw it through the flame, stain it with methylene-blue, and examine it under oil-immersion. As a control-test we will employ Gram's method of decolorization.

If the result of this examination is questionable, we will then at once resort to a bacteriologic investigation. For safety's sake we advise to plant cultures even then, when microscopical examinations have repeatedly yielded a concurring negative result. Cultures will then determine with an absolute certainty the presence or absence of the gonococcus.

As regards the *third* possibility, when the secretion contains mostly pus-cells as its morphological constituent; we have then to deal with a blennorrhagic process either of a mixed type or a secondary infection. In such a case the gonococci have vanished for good. Either the soil has been made inimical to their growth by other cocci not yet determined, or the gonococcus might have undergone disintegration through hyperplastic connective-tissue changes (strictures) caused by its protracted presence there. We regard such a case in a sense infectious, and pronounce it as such to the candidate for marriage until his bacillary or catarrhal urethritis is cured.

As the matter stands at present, there are two views current as regards chronic gonorrhea and permission to marry. Those who advocate the decision of the question on a purely clinical basis, and those who hold the opinion that only microscopical and bacteriological examination should be

decisive. It is the old controversy between Behrend, who adheres to the old astringent treatment of gonorrhea, and Neisser, the founder of the microbic origin and etiological treatment of gonorrhea with the silver-salts. Behrend and his followers, Broeze, Schiller, Kromayer, and others, maintain that "the demonstration of the gonococcus has a positive value only in those cases where other clinical methods make its use superfluous, while in other cases their demonstration is so unreliable as to be valueless." In the face of the indubitably exhaustive microscopical and bacteriological researches of Neisser, Ernest Frank, Janet, Finger, and a host of other investigators, the contention of the former investigators is an untenable one. The antiseptic treatment of gonorrhea in connection with examination for gonococci is without doubt the only rational method at present. It rests on exact scientific facts, and cannot be replaced by a solely clinical aspect of the matter.

Kromayer maintains in a recent publication that the physician has no right to give permission to marry even after repeated examinations have shown that no gonococci are present. While we are perfectly aware that such may be lurking somewhere in spite of all our endeavors, yet there must be a line drawn, or else about ninety per cent of the male population would be condemned to celibacy. Nothing short of mathematical accuracy to demonstrate the non-infectiousness of the individual would satisfy the opponents. But how few, if any, are the instances in our science and therapy where absolute assurance is possible or required? The surgeon removes the cancerous neoplasm with the relative assurance of restitution. Can he be blamed when, after all, general carcinomatosis develops? It is agreed that syphilitics may marry after they have undergone systematic treatment, when four or five years have elapsed since the onset of the infection, and at least one year after the last specific symptoms have existed. We

know that they marry with reasonable security, and we do know that healthy offspring is begotten. Why then shall gonorrhea alone be on the proscription list? Surely the syphilitic taint is not less destructive than the gonorrhoic infection. Of course it would be an ideal standpoint were we enabled to presage with absolute certainty the time when neither of them is again capable of infecting.

But only the relative is our lot, the absolute is denied to us! To resume on what has been said on this topic, we take the stand that we will give *permission to marry* to those having had gonorrhea when, after repeated and careful microscopical examination of slide specimens and exhaustive bacteriologic and microscopic investigation of the threads and the secretions of the prostate and seminal vesicles, done under the strictest rules and with the aid of Gram's method, the presence of gonococci cannot be demonstrated.]

CHAPTER XVI

CONCLUSIONS

CHRONIC gonorrhea of the urethra in man is an affection of invading character; its lesions, which may involve all the constituent elements of the canal, are the result of the evolution of a neoplastic infiltration set up by the presence of the gonococcus.

The gonococcus may remain in the canal during the course of chronic urethritis, that is to say, during an indefinite time. Its virulence may then become attenuated, and only show itself by the invading character of the lesions and the obstinacy of the disease. It may also begin again after a period, and thus give to the affection the acute or contagious character which it had seemed to have lost. It is impossible to determine at what moment, the gonococcus having disappeared, the disease ceases to be transmissible.

The gravity of chronic urethritis results, first of all, from the complications of all kinds which it can produce in man; it depends, besides, upon the danger of contagion and the redoubtable series of genital accidents that it produces in woman.

It is, therefore, an absolute necessity to cure chronic urethritis in man.

To succeed in attaining this end we must, first of all, establish a precise diagnosis based upon a complete methodical examination of the patient, dealing with the pathological secretions which are presented under the form of a discharge, or of flocculi floating in the urine.

We must know the nature of these secretions, as

to whether they contain gonococci, and endeavor to determine their origin. We will investigate, especially, whether they come from the anterior portion of the canal, or from the posterior region, and whether the bladder and the prostate are also diseased.

We must then proceed to the examination of the adnexa of the urethra, and chiefly to that of the prostate.

Finally, we will examine the canal itself. We will make use of the various well-known explorers—bougies, bougie à boule, urethrometers, etc., and have recourse also to the urethroscope.

The employment of this instrument in the diagnosis and treatment of chronic affections of the urethra has a value analogous to that of the ophthalmoscope, laryngoscope, etc.

Among the urethroscopes employed today there is only one which gives satisfactory results: that is the urethroscope of Oberländer.

This permits us to illuminate the urethral mucous membrane so as to perceive the minutest details. The advantages of this instrument are considerable; therefore it ought to be preferred to all others. [The newer urethroscopes, with mignon lamps and without water-cooling device, are of course preferable. They are built after Oberländer's model.]

The urethroscope should not serve for diagnosis only, but we must rely upon it during the whole course of treatment, as it enables us to follow the course of the cure and to properly apply the principles of therapy. We know of only one means of acting directly upon the fibrous infiltration which constitutes the essential lesion of chronic urethral gonorrhea: this is dilatation.

Dilatation may be carried out by means of bougies, but in this way we do not reach a complete result, because the caliber of the canal is not uniform through its whole extent. The dilators, however, conform perfectly to this require-

ment; thanks to their use we surely do succeed in setting up resorption of all the infiltration tissue capable of disappearing. The parts which cannot be made to undergo absorption are transformed into indifferent cicatricial tissue, incapable of giving rise to recurrence or to transmission of the disease.

The use of dilators cannot be left to chance, under penalty not alone of complete failure, but also of the risk of producing irritation and traumatic lesions. The rules which should govern the use of these instruments vary according to the form of urethritis we have to deal with, and their *ensemble* constitutes a special method of treatment. If we wish to attain a complete cure, it is indispensable to adhere scrupulously to them. Under these conditions we may be sure of success.

To declare a case of urethral gonorrhea cured we must show:

1. That there is no longer any trace of purulent secretion (discharge, urinary filaments).

2. That the canal no longer shows any kind of inflammatory lesion when examined through the urethroscope, that the foci of infiltration, whose resorption we have not been able to obtain, should have passed into the condition of indifferent cicatrices, as the end-stage of their evolution.

PLATE I

FIG. 1. *Normal Urethra with Vascular Mucous Membrane.* Mucous membrane with smooth and brilliant surface. Radiating folds fine and multiple (longitudinal folds). Longitudinal striation. Punctiform central figure (middle portion of penile urethra).

FIG. 2. *Normal Urethra with Anemic Mucous Membrane.* Mucous membrane pale and yellowish, with smooth and brilliant surface. Folds fine and less numerous. The striation of the vascular mucous membrane scarcely visible, above light vascular arborization. Central figure oval. (View taken from the entrance of the canal behind the glans penis).

FIG. 3. *Soft Infiltration (Acute Urethritis; beginning of the chronic form).* Mucous membrane uniformily inflamed, hyperemic, brilliant. Epithelium swollen. A few large folds close to the central figure.

Fig. 1

Fig. 2

Fig. 3

PLATE II

GLANDULAR URETHRITIS

FIG. 4. *Glandular Urethritis. Hard Infiltration of the First Degree (before treatment).* Infiltrated mucous membrane. Epithelium in state of desquamation. Central figure closed by large irregular folds. Striation obliterated. Above and to the left, two plaques of pale infiltration with red punctiform orifices of inflamed glands of Littre. To the right, an inflamed Morgagni crypt, open and prominent. Lower, two hypertrophic orifices of Littre glands.

FIG. 5. *Same form and degree as Fig. 4 (after the first dilatations).* Mucous membrane less infiltrated. Epithelium less desquamating. Folds smaller and more numerous. The orifices of Littre's glands, which were simply inflamed in the infiltration plaques, have disappeared. The swelling of the orifices of the glands and crypts have diminished, other orifices have shown up after the swelling of the mucous membrane has gone down.

FIG. 6. *Same form and degree as Figs. 4 and 5 (nearly cured).* Mucous membrane has a nearly normal color and reflection. Folds irregular. Striations have reappeared. Epithelium regular. Orifices of the glands and crypts free from swelling and of nearly normal color and aspect.

Fig 4

Fig 5

Fig 6

PLATE III

DRY URETHRITIS

FIG. 7. *Dry Urethritis. Infiltration of Second Degree (before treatment).* Mucous membrane has the aspect of dead skin, without folds, without striation. Epithelium dry, without the slightest brilliancy and in state of desquamation. Central figure widely open, base obscure, indistinct. Neither glands nor lacunæ. (Below we see the shadow of the light-carrier, the endoscopic tube is slightly inclined downward to disclose the upper wall of the urethra.)

FIG. 8. *Same form and degree as Fig. 7.* Large submucous nodosities project into the endoscopic field. They are covered with a thickened epithelium in state of desquamation.

FIG. 9. *Dry Urethritis—Form with Vesicles—Hard Infiltration of First Degree (before treatment).* Mucous membrane of dull and dirty aspect. Folds effaced. Striation visible in places. Epithelium in desquamation; not a single orifice of a gland nor of a lacunæ. Numerous vesicles of various size and prominence according as they are situated more or less deeply in the mucous membrane.

FIG. 10. *Dry Urethritis. Infiltration of the Second Degree (after the first dilatations).* Mucous membrane of a uniformly yellowish and dull aspect (cadaveric aspect). Epithelium dry, without glitter and in state of desquamation; neither glands nor lacunæ. Below a red rhagade or fissure, the remnant of the last dilatation. Central figure open.

FIG. 11. *Mixed Urethritis. Hard Infiltration of the Second Degree (in course of treatment).* Mucous membrane of less cadaveric aspect. Central figure gaping; a few folds. Upon either side of the figure a prominent large vesicle of grayish appearance; below, a crypt or gland with inflamed and partly opened orifice; same upon the side.

Fig. 9

Fig. 10

Fig. 11.

Fig. 7

Fig. 8

PLATE IV

POSTERIOR URETHRITIS (MEMBRANOUS AND PROSTATIC PORTION)

FIG. 12. *Membranous Urethra in a Normal State.* Mucous membrane fine and brilliant, uniformly well colored. Radiating folds, regular, delicate, and very numerous.

FIG. 13. *Urethritis of the Membranous Portion. Hard Infiltration of the First Degree (before treatment).* Mucous membrane rosy with gray plaques, slightly yellowish, of dull aspect, dry. Epithelium thickened and in state of desquamation. The radiating folds, fine and characteristic of the region, are replaced by larger and less numerous folds.

FIG. 14. *Prostatic Urethra in Normal State.* Below, the regularly rounded, yellowish rosy prominence of the verumontanum, with mucous membrane smooth and shining. All about, separated from the verumontanum by an ill-defined furrow, the mucous membrane of the upper wall of the urethra is of a darker red and of a slightly dull aspect. Quite at the lower part, the circumference of the figure is encroached upon by the shadow of the light-carrier.

FIG. 15. *Urethritis of the Prostatic Portion. Hard Infiltration; Transition Form of Soft Infiltration (before treatment).* Mucous membrane dull red, without life, yellower upon the verumontanum, which is swollen and slightly deformed by infiltration; the orifice of the prostatic utricle is gaping and slightly compressed on the side. Quite at the lower part is the shadow of the light-carrier.

Fig. 12

Fig. 13

Fig. 14

Fig. 15

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